CW Report

Chemical Week

December 18, 1954 Price 35 cents

Permutit's Paulson and Mindler chart ion exchange's steady growth in a legion of uses . p. 42

When the Seaway comes, Ashtabula will be ready; Nelson Pinney is the moving force . . . . . p. 18

Middleman between home office and field is the district manager; here's his job . . . . . p. 61

Darkroom replaces the drawing board as photographs of models become 'blueprints' . . . . . p. 74

Chemical process firms recruit electronic computers to save research man-ho

A McGRAW-HILL PUB

E P POWER
UNIVERSITY MICROFILMS IN
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ANN ARBOR MICH

Mathieson Caustic Soda: *why settle for less?*

In the lime-soda process—one of the two important methods of making caustic soda—the causticizing operation begins in huge settling tanks like those above. Here, a soda ash solution is treated with milk of lime, calcium carbonate is precipitated and a dilute caustic liquor obtained. This liquid is then filtered and concentrated to the commercial 50% and 73% solutions, as well as to the solid, flake, and granular forms. Lime-soda process caustic is produced at Lake Charles, La., and Saltville, Va.; four other strategically located plants produce electrolytic process caustic to make Mathieson a major source of this essential chemical raw material.

Multiple-process and multiple-plant facilities give Mathieson's caustic soda customers the dependability they want. It means their source of caustic is not controlled by seasonal fluctuations in chlorine demand as is sometimes the case when production is limited to the electrolytic caustic-chlorine process. This operational flexibility is also typical of other Mathieson chemicals—5 chlorine plants, 7 sulphuric acid plants, 3 alkali plants, 3 ammonia plants, provide a safety factor that assures a reliable source of chemical raw materials.

Call on us when planning current or future chemical requirements. Perhaps you can buy to better advantage from one of America's largest producers of basic industrial chemicals.

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INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

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CAUSTIC SODA • SODA ASH • CHLORINE • SULPHURIC ACID • SULPHUR • AMMONIA • NITRATE OF SODA • BICARBONATE OF SODA • NITRIC ACID • SULPHATE OF ALUMINA • SODIUM CHLORITE PRODUCTS
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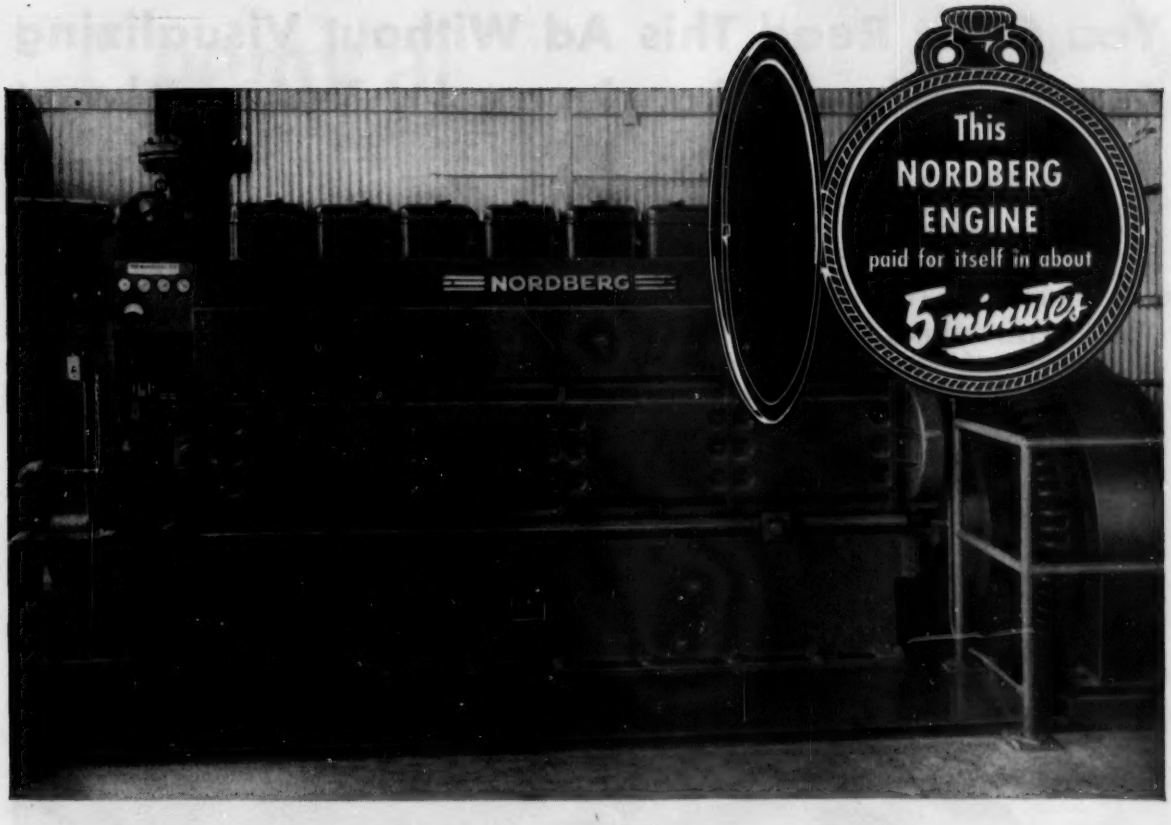

Owens-Corning Fiberglas protects big plant investment with dependable Diesel stand-by power . . .

This Nordberg 720 hp, 500 kw Diesel generating unit supplies emergency power for the big Owens-Corning Fiberglas plant at Santa Clara, California.

To guard against shutdown caused by a failure of purchased power, the Nordberg Diesel is ready to take over the plant load at once, thereby protecting a huge plant investment in costly processing machinery. To make sure full power is instantly available, the engine is constantly maintained at operating temperature. Once each day the engine is started, paralleled with purchased power, and the plant load taken over for a short period . . . assuring its readiness, and training personnel for emergency operation.

Since this installation was made, several main power failures have occurred without warning. *In each case, the Nordberg stand-by unit was on the line and supplying emergency power within three minutes.* This service has more than saved the Diesel's original cost.

Here, then, is another outstanding example of the way Nordberg engines are serving industry.

NORDBERG ENGINES FOR EVERY CHEMICAL-PROCESS POWER NEED

For regular or emergency service, you can't beat the advantages of Nordberg Diesels. They can be added to the line quickly, can be held ready for instant service without exorbitant standby expense, and are available for fully automatic operation. In the complete line of Nordberg two and four-cycle Diesel engines, including both oil and gas burning types, you will find exactly the right unit to meet your present and future power requirements . . . from 10 to over 10,000 horsepower.

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

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Milwaukee, Wisconsin
Builder of America's Largest Line of Heavy Duty Engines

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Nordberg Mfg. Co., Milwaukee, Wisconsin
Send information on Nordberg engines in the _____hp range for _____service.

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Company_____
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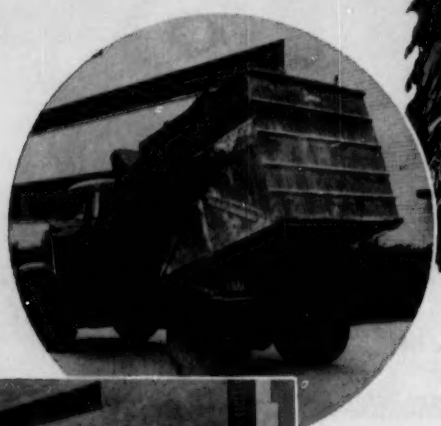
City_____ Zone____ State_____

P854-CW

You Can't Read This Ad Without Visualizing Tremendous Savings in Your Plant

If the handling of bulk materials is required in your plant, be they raw, finished, moist, liquid or rubbish materials, read these simple facts about the Dempster-Dumpster System. Then, visualize its application and tremendous savings possibilities in your own operation.

VISUALIZE HAVING ONLY ONE TRUCK with scores of bodies. One truck-mounted Dempster-Dumpster with only one man, the driver, serving many detachable Dempster-Dumpster Containers. These containers range from 2 to 21 cu. yds. capacity for use with recommended type Dempster-Dumpsters, and each container built to suit the materials to be handled—be they solids, liquids, dust, bulky, light or heavy. You place a container at convenient materials accumulation points, in or out of plant. As each is loaded, it is picked up, hauled and dumped, or the load is set down intact, and the entire operation is handled by hydraulic controls in cab by only one man, the driver.



The photographs above were made in the plant of one of the nation's leading brands of soaps and dentifrices. This installation comprises a single Dempster-Dumpster and 49 containers. Photos illustrate the simple one man pick up, hauling and dumping operation of a drop bottom container.

THE NATION'S LEADING FIRMS USE THIS SYSTEM BECAUSE OF ITS AMAZING EFFICIENCY AND TREMENDOUS SAVINGS.

YOU ELIMINATE trucks standing idle . . . eliminate re-handling of materials . . . eliminate loading crews. You increase efficiency, sanitation and good plant-keeping with this amazing Dempster-Dumpster System—the lowest cost method of bulk materials handling ever devised. Write us now for complete information. Manufactured and sold exclusively by Dempster Brothers, Inc.

One Truck-Mounted Dempster-Dumpster Handles Scores of Containers . . . All Designs . . . All Sizes

DEMPSTER BROTHERS, 2124 Dempster Bldg., Knoxville 17, Tenn.

Chemical Week

Volume 75 **December 18, 1954** Number 25

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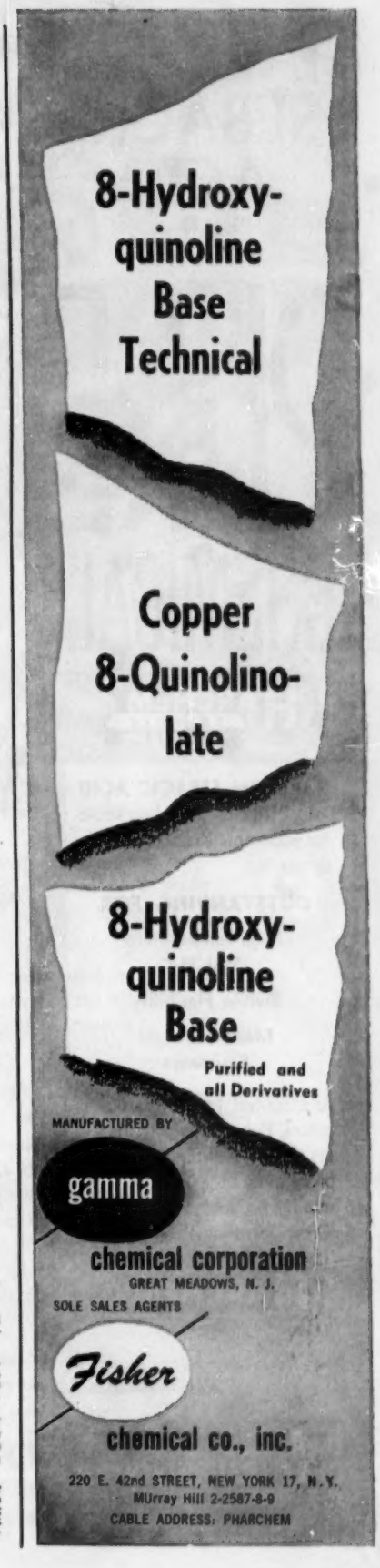


HARCHEM SEBACIC ACID IS A PURE CHEMICAL

THE KEY TO HARCHEM SEBACIC HEAT AND LIGHT STABILITY

HARCHEM SEBACIC ACID is a **PURE** chemical suitable for your most exacting developments.

OUTSTANDING FOR

High Temperature Stability

Built-in Flexibility

Maximum Light Resistance

so essential to Alkyds, Polyesters, Polyamides, Plasticizers, Synthetic Lubricants and production of your other high quality products.

THE KEY TO HARCHEM BETTER PLASTICS

PLASTICIZERS

HARDESTY CHEMICAL DIVISION
W. C. HARDESTY CO., INC.
25 MAIN ST., BELLEVILLE 9, N. J.

OPINION . . . . . .

'Very Much Alive'

TO THE EDITOR: You may have heard about the explosion and fire at our plant about midnight last Friday. If you'd been standing with me just inside the fire lines, you might easily have gotten the impression that Maumee Chemical was really going out of business in a hurry. It's certainly not the case, however, and that's the reason I wanted to get this letter off to you right away . . .

Before going into detail, you will want to know three things:

1. No one was seriously injured.
2. We plan to be back manufacturing our full line of regular products by Monday.
3. Our losses in equipment and materials and our landlord's losses in building are all well covered by insurance.

Not one of our employees nor any of the fire fighters was seriously injured. Larry Lemle, foreman of the department where the blast occurred, was knocked down a flight of stairs by the force of the explosion and was taken to nearby St. Charles Hospital for treatment of a hip injury. Bill Epperly, who was working with him, got down to a lower floor just in time and was not hurt. Bob Oberdorf had a facial cut and a localized flash burn.

The plant boys got me out of bed right after the explosion and by the time I got across town to the plant, it was a real sparkling Fourth of July fire. A three-alarmer—there were thirteen pumpers, five ladder trucks including all the aerial rigs in town, two rescue squads and four chiefs with full crews. Fire Chief Arnold Papenhagen and his men had it all well in hand and brought everything under control in 45 minutes—really an efficient job. Equally efficient was Carleton Rae, manager of the Toledo Red Cross Chapter, and his canteen workers, first aid and motor corps group, who passed out coffee by the gallon until everything died down . . .

The cause of the explosion has not been definitely fixed. Nor have damages been assessed. Right now we're clearing out the rubble. (Old bricks are really for sale!) And Stan Thal, one of our big contractors in Toledo, is front and center with his crews making the remaining plant weathertight and habitable. Arthur Koerber, our landlord, tells us that in the rebuild we can make changes or improvements. So it looks as if part of our plans will include consolidating the receiving, shipping and warehousing in such a way as to give us the most modern materials handling setup in town.

You would enjoy seeing the way all of our employees pitched in. Our office, as you may know, is in a separate building. The blast took out most of the windows for sure, but by Sunday, Stan Thal's boys had glass replaced in most of them, and others were boarded up. Saturday morning our people were busy getting everything in order, arranging for phone lines, reinstallation of downed power lines, checking orders in the house, really taking steps to put our business back on a paying basis in a very short time.

So much for all the hullabaloo.

It's only important that you know that Maumee Chemical is very much alive, very much in business, and aggressive as ever. In a short time, we'll look back on this as a "weekend incident." . . .

GEORGE F. SCHLAUDECKER
President
Maumee Chemical Co.
Toledo, O.

CW took a liberty. Reader Schlaudecker's form letter was addressed to "our customers, suppliers and friends," but we thought it was such a good example of forthright and sympathetic public relations that it deserved excerpting.—ED.

Fertilizer Pays

TO THE EDITOR: Mr. H. C. Kuthe's contention in his letter (*Nov. 27*) is that sufficient marginal land is available for the pasturing of livestock, which thus reduces or eliminates the need for growing animal feed on good crop land. Under these circumstances, the nitrogen used for feed production would not be required.

Agricultural experts generally agree that the U.S. is approaching the point where land available for the economic growth of food and fiber is already being utilized. The marginal lands are considered too costly to reclaim for economic growth.

The land now available for economic pasturing of livestock can be improved greatly to increase the yield

CW welcomes expressions of opinion from readers. The only requirements: that they be pertinent, as brief as possible.

Address all correspondence to: W. A. Jordan, Chemical Week, 330 W. 42nd St., New York 36, N. Y.

Sinclair...

taking 7-league strides to pace the rise of petrochemicals

No one knows better than Sinclair how fast America's chemical industry is growing. Since chemists first looked at a drop of oil, and decided to make something of it, the petroleum industry has been kept jumping to supply the growing demand for petrochemicals.

One percent of all U.S. chemical production in 1930 was based on petroleum chemistry. Today, more than 25% of all chemicals started in the oil fields. By 1962, it is estimated that half of America's chemical production will be derived from petroleum and natural gas.

That's why Sinclair isn't satisfied merely to meet today's demand for petrochemicals. Tomorrow is coming, and we want to be certain that tomorrow's chemists will have new and better petrochemical building blocks – to make tomorrow's products. At this very moment in Marcus Hook, Sinclair is building an Aromatics Recovery Unit which will recover Toluene, Xylene Solvents and heavier aromatic solvents. In conjunction with this facility, a ParaXylene unit is being constructed to produce a major raw material for Polyester Synthetic Fibers . . . Behind these units are plans for others . . . all to take their place beside the Sinclair chemical facilities now producing at Houston, E. Chicago and Marcus Hook.

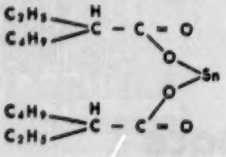
Looking out for tomorrow's customers as well as today's – that's Sinclair's idea. And the fact that we have more customers today than we had yesterday offers pretty good proof that you get ahead only by looking ahead!

Sinclair Chemicals, Inc.
(Subsidiary of Sinclair Oil Corporation)
600 Fifth Avenue, New York 20, N. Y.

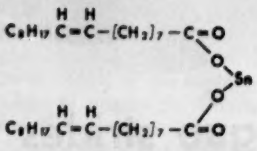
From the M&T Research Laboratory

A New Group of Stannous Soaps

Now available in pilot plant and research quantities is an interesting group of new tin chemicals comprising a wide variety of solvent-free stannous soaps.



STANNOUS OCTOATE



STANNOUS OLEATE

Examples of these new tin soaps are Stannous Octoate and Stannous Oleate, which have the following properties:

CHEMICAL NAME	FORMULA	DESCRIPTION	SUGGESTED USES
Stannous Octoate	$Sn(C_8H_{15}O_2)_2$	A clear, light yellow, somewhat viscous fluid. Contains approximately 28% tin.	Used as a polymerization catalyst for curing silicone oil emulsions.
Stannous Oleate	$Sn(C_{18}H_{33}O_2)_2$	A clear yellow viscous liquid. Contains approximately 17% tin. Can be emulsified readily without adding protective colloids.	Experimentally used as a catalyst for curing silicone oil emulsions.

Other similar tin soaps which have been produced on a laboratory scale are:

STANNOUS CAPRATE
STANNOUS CAPROATE
STANNOUS CAPRYLATE
STANNOUS LAURATE
STANNOUS MYRISTATE
STANNOUS NAPHTHENATE
STANNOUS PALMITATE
STANNOUS STEARATE

If chemicals of this type have a place in your processing, our Technical Service people will be glad to discuss their application with you. Meanwhile, write for more detailed data on M&T Stannous Soaps.

METAL & THERMIT CORPORATION
Chemical Division
100 EAST 42nd ST., NEW YORK 17, N. Y.

OPINION . . . . . .

per acre. Because of the degree of mechanization and the status of grass strain development, fertilizers will probably prove to be the most important single factor in increasing livestock production per acre. Experiments are being conducted in many sections of the country to determine the optimum level of fertilizer application on pastures for maximum return. Although the results of the experiments are not conclusive as to the optimum level, they do seem to indicate that heavier application of fertilizers is economically justified.

It appears that Mr. Kuthe is overlooking a very important incentive of the farmer, that is, to produce agricultural products as economically as possible in order that maximum profits can be realized. Experience to date indicates that, in general, the larger the production per acre, the lower the fixed costs per unit of production, and consequently the higher the profit margin. Obviously there is a point of diminishing return, but this point is far from being reached in the U.S. as a whole. Although perhaps not controlling in all cases, the application of fertilizers is an economic way of increasing production per acre.

Assuming that no growth in livestock population is forthcoming, the increased use of pasturage will tend to decrease the requirements for feeding, and more acreage would become available for food growth for human consumption. However, with the rapid rate of population increase, additional livestock production will be required and will have to come both from more efficient utilization of pastures and from grain feeding. Further indication of the need for more livestock production is the shift to a higher protein diet in the U.S.

Because of the above factors, we feel strongly that the future of nitrogen in agriculture is very promising, and it is unlikely that, "from 1958 on, the present ammonia plants using natural gas or coke will have to go out of business."

S. E. PERKINS
Arthur D. Little, Inc.
Cambridge, Mass.

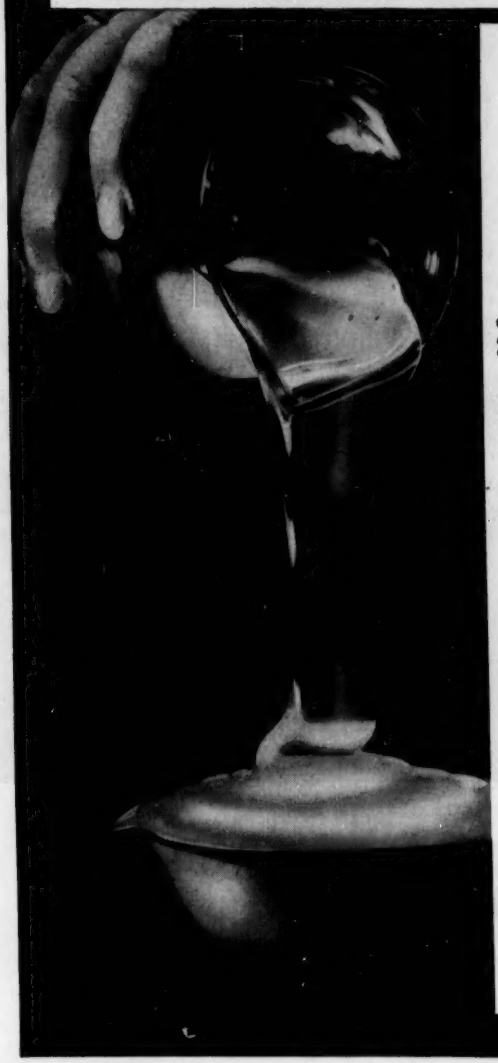
DATES AHEAD . . .

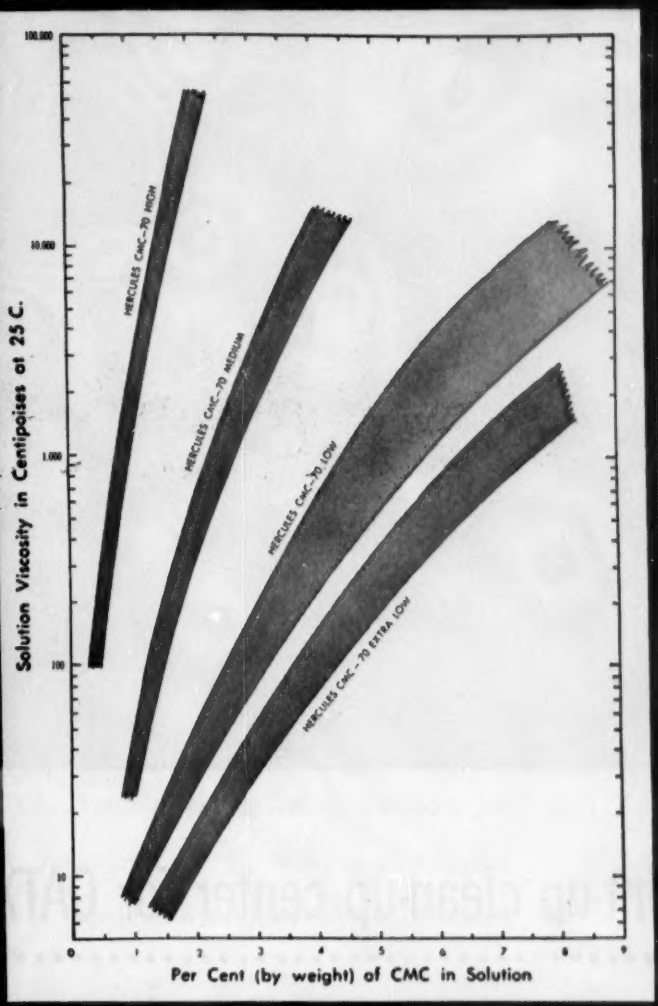
Chemical Market Research Assn., joint meeting with CCDA, subject: chemicals in foods and feeds, Edgewater Beach hotel, Chicago, Jan. 20-21.

Plant Maintenance and Engineering Show, International Amphitheatre, Chicago, Jan. 24-27.

Chlorine Institute, annual meeting, Biltmore hotel, New York, Jan. 26.

Cellulose Gum (CMC)





Curves show the viscosity-concentration ranges at 25°C for four types of Hercules CMC: CMC-70 Extra Low, CMC-70 Low, CMC-70 Medium and CMC-70 High. Photograph at left shows one thickening effect possible with a CMC-water solution.

THIS ECONOMICAL WATER-SOLUBLE GUM HAS UNEQUALLED VISCOSITY RANGE

With cellulose gum (Purified Hercules® CMC) now available in ten different types, this water-soluble colloid meets all requirements for a thickening agent. Some indication of viscosity concentrations possible is given in the chart above.

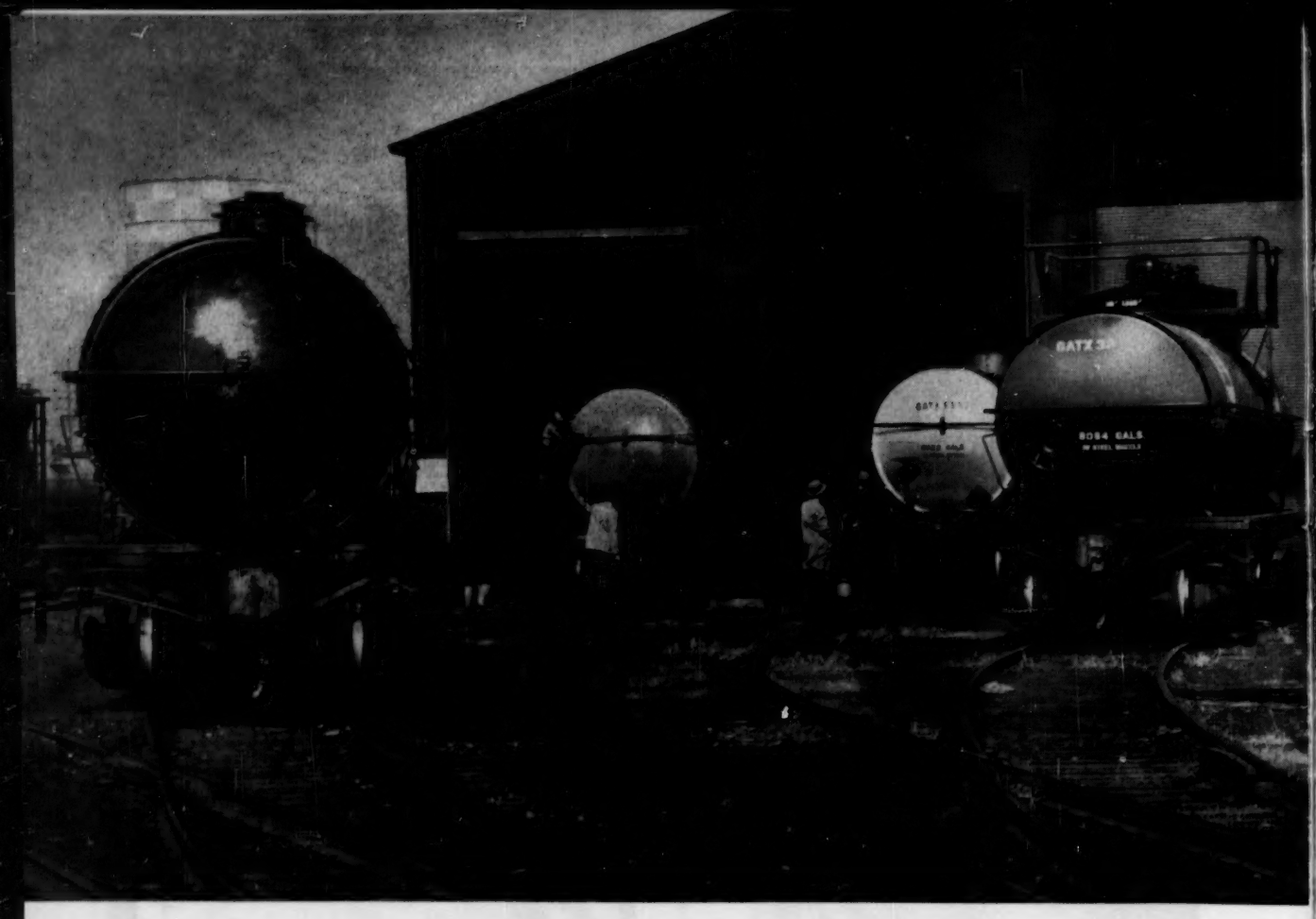
Hercules cellulose gum has exceptionally high purity (99.5%+); is compatible with a wide variety of gums, plasticizers, and resins; is insoluble in organic solvents; and is uniformly high in quality from lot to lot. Write for testing samples, indicating proposed uses so that we may determine the proper types.

Cellulose Products Department

HERCULES POWDER COMPANY
INCORPORATED

992 Market Street, Wilmington 99, Delaware

CM54-2



paint-up clean-up center for GATX tank cars

Forty tank cars can be serviced in this paint shop at one time. Every surface—interior and exterior—that can be painted, sprayed or brushed gets its protective covering here. After the car has gone through the mechanical department for necessary maintenance and repair work the important car reporting marks, advertising decoration and other stencilled information are applied. These surface finishes applied at the General American car repair shops increase the usefulness of the 48,000 GATX tank cars and keep cars available for duty.

To keep the fleet rolling, General American's more than 30 car repair shops work with the Engineering and Traffic departments to give shippers more dependable service for transporting liquids in bulk.

Car repair shops throughout the U.S.A.

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street, Chicago 90, Illinois
Offices in principal cities

NEWSLETTER

Chemical expansion spending, though down for the first quarter of next year, will still total over a quarter-billion dollars. The Commerce Dept.-Securities & Exchange Commission's periodic rundown of spending plans shows that chemical industrialists propose to spend $263 million—compared with $273 million and $306 million in this year's third and fourth quarters, respectively. This current quarter's figure of $306 million is a downward revision of the estimate made back in August, when chemical businessmen thought they would spend $335 million during October-December *(CW, Sept. 25, p. 18)*. One reason offered for the trim: dimmed hope after the November election of a cut in the corporate tax rate.

The Commerce-SEC figures aren't the same, of course, as the Manufacturing Chemists' Assn.'s *(CW, Nov. 27, p. 15)* or McGraw-Hill's *(CW, Nov. 13, p. 24)*. But that doesn't mean that there's any discrepancy among them. They embrace overlapping but different segments of the U.S. industrial complex; still, by different paths, they all arrive at a remarkably coincidental end result.

•

Here are this week's fast tax write-off certificates buttressing the process industries' capital spending:

- Gulf Research and Development Corp., Allegheny County, Pa., $2,202,000 at 45% for research facilities.
- Downing Crystal Co., Westminster, Md., $65,000 at 45% for quartz crystal manufacturing.
- National Gypsum, Tonawanda, N. Y., $943,375 at 45% for research and development facilities.
- Stupakoff Ceramic & Manufacturing, Latrobe, Pa., $598,800 at 70% for alumina ceramics.

•

Synthetic fibers will come up for discussion in Congress next year. Labeling of synthetic and blended fabrics will be included in an omnibus fabric label bill worked out by the National Retail Dry Goods Assn. to replace the present welter of laws and executive agency regulations covering various materials.

•

• The seventh uranium plant expansion on the Colorado Plateau since last May has been announced by the Atomic Energy Commission.

An amended contract between AEC and Vanadium Corp. of America provides for increasing the capacity of the latter's facilities at Naturita, in southwestern Colorado.

Other expansions during the past eight months: two at Anaconda Copper Mining's Grant, N. M., unit; Vitro Uranium's Salt Lake City, Utah, plant; Vanadium Corp.'s Durango, Colo., facilities; Climax Uranium's Grand Junction, Colo., plant; and the federal government's operation at Monticello, Utah.

•

More Western activity: Wyoming Natural Resources Board confirms the report that Reynolds Metals is looking hard at the Lake DeSmet

area near Buffalo, Wyo., as a possible site for a power plant and aluminum reduction facilities. Under particular study is the extent of subbituminous coal deposits.

•

The government's rubber disposal commission has passed the four-fifths mark in negotiating sale of federally owned facilities, has arrived at substantial agreement with bidders for that proportion of the 543,000-long-tons/year capacity slated by Congress for sale. Too, the commission is sure that it can reach agreement on the remainder before the Dec. 27 deadline.

First official word on which company gets what plant will come when the commission signs contracts—and it hopes to sign a few this week. It won't discuss prices, though, until it submits its report to Congress next month.

•

Even veteran Wall Streeters are agog at the recent rapid rise of Howe Sound stock. A producer of copper, lead and zinc, the firm is also owner of the Garfield, Utah, refinery exploiting Chemical Construction Co.'s acid leach process of extracting cobalt.

Howe Sound's stock, as low as 11 this year, closed last week at slightly over 20; for the past month it has been consistently among the leaders in volume traded. One possible explanation: Chemico is putting in some major equipment at Garfield, and more will be installed next March; Chemico took over active management of the plant (*CW, Jan. 30, p. 18*) because of start-up difficulties (*CW, Sept. 26, '53, p. 49*). Now it appears that the refinery is on the brink of full-scale production.

But there's more to it than that. Reports are rife on Wall Street that Floyd Odlum's Atlas Corp.—already deep in mining interests (including uranium)—is picking up the stock.

•

There's more than a name change in store for National Farm Chemurgic Council. It will vote at its annual meeting next March on a recommendation to change its name to Council for Agricultural and Chemurgic Research, and at the same time it will consider a new charter and bylaws that will extend its activities to production and marketing research as well as crop utilization.

•

National Petro-Chemical has won its petition to have its upcoming pollution trial moved to a different Illinois county. Charged with polluting the Kaskaskia River, the company asked for a change of venue on grounds that "inflammatory" newspaper stories made a fair hearing "impossible." Also, says the firm, so many local residents took part in a march on the state capital that an unbiased jury could not be obtained.

Circuit Court Judge Warren Holt has moved the trial to Montgomery County—three counties away from the Tuscola plant.

•

Federal Trade Commission is cracking down on extravagant advertising for liquid fertilizers. Ra-Pid-Gro Corp. (Dansville, N. Y.) was accused last week of making false claims; Stern's Nurseries (Geneva, N. Y.) agreed to stop advertising its product as a "new discovery."

•

Prosperity Note: sales of red ink, traditional vehicle of financial bad news, have dropped 21% this year, says Parker Pen Co.

... The Editors

so effective...
so easy to make

SODIUM amide

Aminations and dehydrations can be performed most effectively with sodium amide.

This valuable intermediate can be prepared by reacting sodium metal with ammonia, two easy-to-handle chemicals. Under proper conditions, high purity and yield are obtained.

This is but one of the many applications of sodium in industry. Perhaps *you* can use this versatile chemical to increase the efficiency of your process.

Our engineers, with broad industry experience, will gladly work with you to develop the application best suited to your needs. We will welcome your inquiries.

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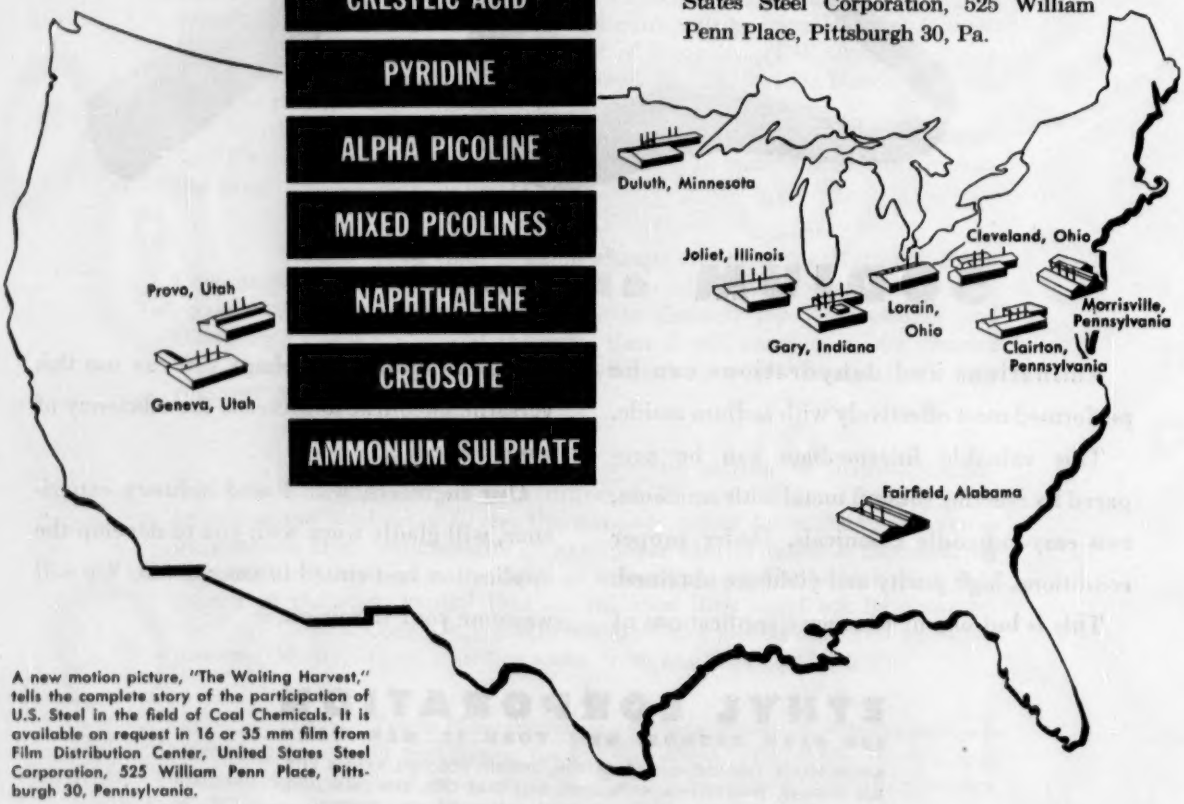

A new motion picture, "The Waiting Harvest," tells the complete story of the participation of U.S. Steel in the field of Coal Chemicals. It is available on request in 16 or 35 mm film from Film Distribution Center, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS Coal Chemicals

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UNITED STATES STEEL

BUSINESS & INDUSTRY. . . .

All Set for a Tangle

Like Pandora opening her box, the Tariff Commission, investigating charges of East German potash dumping, seems to be uncovering a number of similar evils. That's the word from Washington this week as U.S. potash producers prepare for another round in their fight against "unfair foreign competition."

Hearings have been scheduled for Jan. 18 to determine whether U.S. industry is being injured by importation of potash from the Soviet Zone of Germany, but there's a good chance now that the inquiry may be broadened to include possible dumping by such other potash producers as France, West Germany and Spain.

The Tariff Commission's action is actually round two in the current dumping hassle. Under the Antidumping Act, charges made by U.S. firms go first to Treasury, which must determine whether the material concerned is being offered in the U.S. at prices below those charged elsewhere, or below cost of production.

In this case, all six major U.S. potash producers (American Potash & Chemical, Duval Sulphur & Potash, International Minerals & Chemical, Potash Co. of America, Southwest Potash, and U.S. Potash) jointly charged that East German potash sold here at $24/ton, was priced at $39/ton in Great Britain and at $30/ton in Denmark.

On the basis of the reports of two of his investigators in Europe this summer, Assistant Secretary of the Treasury H. Chapman Rose found that such price dumping had occurred (*CW, Dec. 4, p. 19*). He then referred the matter to the Tariff Commission, which is charged with determining within 90 days whether such importation injured domestic industry. If injury is found, Treasury then must assess duties to make up the difference between foreign and U.S. price.

Could Be a Question: The domestic potash industry may have a difficult time proving its case, however, on the basis of total import figures alone. Except in the year 1951, when domestic companies were shut down by strike, imports have accounted for a steadily decreasing share of the U.S. market, dropping from 14% (in 1950) to 7% (in the first six months of 1954).

Too, since transportation costs make up a large part of total potash prices, there is some question as to whether imported material would be competitive any great distance from U.S. seaports.

On the other hand, the emotional connotations of Soviet trade will provide U.S. potash producers with a strong argument. Such grounds were effectively used, for example, during 1953 Congressional hearings on the subject. Said Rep. Thomas G. Abernethy of Mississippi: "Even though it might be cheaper, I cannot conceive of any patriotic American citizen knowingly buying Communist goods, which in turn puts dollars into the hands of the Russian treasury."

WIDE WORLD

ROSE: Finds charges of potash dumping all too true.

Such an appeal undoubtedly helps the U.S. producers' case. But if the Treasury Dept. indicates that others besides the East Germans have been guilty of price dumping, it would negate use of this argument by domestic producers.

Potash producers would then probably fall back on the argument expressed to investigators by George Pettit, Potash Co. of America vice-president, last year. Said Pettit: "We are not seeking protection of an American industry that is uneconomic or too delicate to stand on its own feet, or too fragile to stand up against legitimate foreign competition."

With such conflicting views, observers are betting that the battle between domestic producers on the one hand and importers on the other will be one of the best free-for-alls Washington has seen in many a moon.

Question of Degree

There's little doubt that more manufacturers will get a crack at defense contracts as a result of the new Pentagon directive last week, but there's considerable disagreement over how much the new order will affect present policies.

The directive, issued by Defense Secretary Wilson, tells the military services in so many words to plan their buying in such a way that it will help preserve a sound mobilization base. This, he goes on, can best be accomplished by maintaining multiple sources of supply and "otherwise spreading out contracts" even if the government has to pay higher prices to do it.

Chemical companies, of course, won't be hit as hard by the order as will a few large auto companies like General Motors that hold heavy government contracts. But many of them are sure to notice the difference in sales volume—if the order is carried through to its extremes.

Behind the Scenes: Democrats in Congress, in particular, have charged repeatedly in recent months that the military buying practices pursued by Wilson have favored large companies, with a resulting "narrowing of the nation's mobilization base."

Sen. Jackson (D., Wash.) had even openly accused Wilson of showing a preference for GM in parceling out new orders. Such accusations may in part lie behind the new directive, especially, as one observer points out, if the Democrats should start an investigation of military buying practices.

Only items covered in the Preferential Planning List will be covered, however, by the order. There is thus wide room for speculation as to how greatly it changes present policies—if at all.

Princeton 6. XII. 54.

Liebe und verehrter Albert Schweitzer!

Es kommt hier eine bescheidene Gabe zu Ihnen, die Sie mit Ihnen alle wohlmeinenden Menschen freuen wird, obwohl der Anlass der Begehrlichkeit ein traueriger ist. Eine ausgezeichnete Frau und Lehrerin ist hier durch einen Unglücksfall plötzlich entrissen worden. Ueberlebende Freunde und Kollegen suchten einen Weg, ihre Verehrung für die Verstorbene zum Ausdruck zu bringen. Da Sie nun gerade Dankbarkeit für Ihre eigenwilligen Leistungen meiste von allen Betreuten als der beste Weg empfunden, [illegible] mit meinen herzlichen Wünschen und den herzlichen Wünschen aller, die hier mitgewirkt haben

Ihr
A. Einstein.

Generosity Evokes Generosity

ALBERT EINSTEIN in Princeton last week accepted a memorial gift of $500 worth of antibiotics on behalf of his friend, Albert Schweitzer. The gift was originated by students at Hun School, Princeton, who wanted to set up a fitting memorial for their former Latin and German professor, Erna Fankhauser, who died last Nov. 6.

Mrs. Fankhauser was a close friend of Professor Einstein's, and had met Dr. Schweitzer when she was a student in Bern, Switzerland.

Pooling their funds, the students were able to collect only $50 for the gift; but E. R. Squibb & Sons upped the donation to $500 worth of Steclin—a broad-spectrum antibiotic.

Presentation was made to Professor Einstein by Robert Mudd, 18, of St. Louis, president of the Hun School Student Council, at the Einstein home in Princeton.

Professor Einstein wrote the covering letter to Dr. Schweitzer (*see above*) in Lambarene, Gabon, French Equatorial Africa, noting that surviving friends and colleagues had chosen the antibiotic donation advisedly, knowing its value to Schweitzer in his war on disease in underdeveloped regions of Africa.

No Cause for Rejoicing

Out of the incendiary battle over Asian aid raging in the Eisenhower cabinet these days, there'll undoubtedly be some business for chemical companies. But since neither the size nor duration of the program has as yet been settled —much less how the money will be spent—there is no immediate cause for rejoicing.

Those were the sentiments of Washington observers last week as the tug-of-war between the Treasury Dept. and the Foreign Operations Administration broke out into the open.

Humphrey—still smarting over the trial balloons floated by FOA chief Harold Stassen and Secretary of State John Foster Dulles in favor of long-term development credits and technical assistance while he (Humphrey) was in South America telling the Latin Americans that there was not a chance of any spectacular boost in U.S. aid or credits—has refused to discuss (even in theory) the problem of aid to Asia.

"There is no Asian aid program," maintains Humphrey. "What—if anything—we will do in this field is being studied. There's still a lot of work to be done. Until there is a program I'm not going to discuss it."

Stassen, however, wants a 10-year program starting at $500,000 the first year and rising to an annual peak of half a billion. Other administrators want much less—both in money and in duration. Nevertheless, they all agree that if the free nations of Asia are to be kept out of the Communist camp, U.S. economic aid is essential.

The Stassen-Dulles plan continues on the assumption that something spectacular is necessary to stir the Asians out of a "dangerous" state of vacillation. They don't propose the same sort of project as the Marshall aid plan in Europe (where the U.S. invested some $15 billion); would rather see something more modest and different in nature, since most of Asia (unlike Europe) is badly underdeveloped.

Stepped-up Asian aid would certainly mean more orders for U.S. capital goods, immediately—including presumably some makers of industrial chemical equipment. But big or small, the whole emphasis of the program will be on capital investment in Asia to raise living standards over the long term. There would be little or no money spent on consumer goods, as there was in Europe, where the goal was short-time relief and reconstruction.

That it means a business boost to U.S. chemical makers is hence dubious.

No Barrier in Law

Even more of a boom in water fluoridation is foreseen by advocates of that treatment method, now that the U.S. Supreme Court again has refused to upset a state court's ruling that fluoridation is legal.

The high court last week turned down the appeal by an antifluoridation group that had been trying to block fluoridation in the public water system of Shreveport, La. It's possible for the issue to be raised on some different legal count in another lawsuit, but proponents of fluoridation are confident the battle has been won. Previously, the Supreme Court had left standing a decision by the California Supreme Court to the effect that a city government has the right to fluoridate its water.

Ever since the Public Health Service in 1951 approved of fluoridation as a means of helping to prevent tooth decay, more and more cities across the country have installed fluoridation systems (*see table, below*). Yet many other city administrations have been waiting for a reassuring court decision before going ahead with this sometimes controversial measure. Now, say the profluoridation partisans, such a ruling is on the books.

Constitutionality Question: In a tersely worded order, the court simply stated that it would not hear a case brought by several Shreveport residents. No substantial federal question is involved, the court declared. Opponents tried to argue that fluoridation involves a violation of individuals' constitutional rights. The high court's order leaves in effect a Louisiana State Supreme Court decision upholding the Shreveport City Council's fluoridation program.

When the case was first argued, the trial court decided in favor of the antifluoridation side, stating that prevention of dental caries is "strictly within the realm of personal health, within which each person should be free to choose his course for himself." The state supreme court reversed that ruling on grounds that although dental caries may not be contagious, their effect on health is serious enough to justify state or municipal control measures. That's the decision that's left in force by last week's Supreme Court action.

Back in Shreveport, the antifluoridationists still aren't giving up. Now that their court action has failed, Sam Jones Smith—one of the three residents who brought the suit—is proposing that before the city council buys fluoridation equipment, the citizens should have a chance to vote on the issue.

More Users of Fluorides

(U.S. communities that have adopted water fluoridation programs, by years. Source: U.S. Public Health Service.)

Year	No. of Communities	No. of Water Supply Systems	Population Served
1945	7	4	222,549
1946	6	5	94,035
1947	3	2	94,042
1948	10	2	110,515
1949	24	15	341,935
1950	44	32	432,693
1951	225	105	3,119,063
1952	372	185	8,782,485
1953	203	121	2,993,455
1954	153*	86*	4,548,824*
Total to date†	1036	554	20,334,371

* 1954 figures not complete.
† Allowing for communities that have discontinued fluoridation programs.

Attacks by 'Quacks'

Facing stepped-up attacks by the makers of "hocus-pocus remedies," the nation's legitimate manufacturers of drugs and medicines are warming up to U.S. Food & Drug Administration's plea for more money, more men.

FDA now hopes to get from its soon-to-be-appointed "citizens' committee" recommendations that it can use to get larger appropriations from Congress. Speaking at the meeting of the American Pharmaceutical Manufacturers Assn. in New York last week, Food & Drug Commissioner George Larrick warned that "we have reached a point where there are adverse effects on the food and drug industries as well as from the standpoint of the consumer." FDA, he adds, can't do a 1955 job with a 1940 staff.

In a semiofficial statement for the Manufacturing Chemists' Assn., Merck's Fred Bartenstein comments that "it's axiomatic that FDA should have the people and facilities, and therefore the funds, to enforce the law thoroughly."

BURKE & DEAN, CHICAGO

ICWU'S BRADLEY: For union's 10-year president, a pension and a parting.

One Driver's Enough

After more than a year of squabbling over "who's driving this car," leaders of International Chemical Workers Union (AFL) have decided that the steering wheel should be in the hands of incoming President Edward Moffett of Houston, Tex.

Under the ICWU constitution, Moffett's one-year term should not begin until Jan. 1; but in order to halt the bickering that has threatened to split the union, the executive board has made a deal that cuts nearly one month off the lame-duck interim following Moffett's election at last August's convention (*CW, Aug. 28, p. 12*).

This means the end to the 30-year career of outgoing President H. A. Bradley as an AFL unionist. Bradley—who helped put the ICWU together during World War II and has served as its top officer ever since—has agreed to step down four weeks ahead of time, and to drop his lawsuit for an injunction against the executive board.

Pause for Persuasion: This will give Moffett more time in which to try to patch up certain rifts in ICWU ranks before the anticipated merger of the CIO oil and chemical unions next March confronts ICWU with a more formidable rival. For example, Moffett now can try to persuade the 1700 employees of the Hoosier Ordnance Works at Charlestown, Ind., to reverse their recent decision to drop out of ICWU and line up with the "International Chemical Workers Reorganization Committee." That committee is a rump organization set up by pro-Bradley forces that may disband now.

Basis for the settlement: Bradley—

whose salary as president of the union has been $14,000/year—is to be given a $7200/year pension and a life-time honorary membership. This matter was scheduled to be taken up at the convention, but all the time right up to adjournment was taken up by campaign oratory.

To chemical companies that bargain with ICWU locals, the early transfer of power within the union will mean smoother, simpler negotiating, now that the union can speak with one voice.

EXPANSION. . . .

South American Investment: Plans have jelled for construction of a $5-million plant in Suzano, Brazil, by W. R. Grace & Co., Farbwerke Hoechst, and American Home Products Corp. (*Newsletter, Dec. 4*). The three partners are forming a new company to handle the investment, tentatively known as Fongra Produtos Quimicos S.A. Construction work will start early next year; full production is scheduled for 1957.

Although Grace has long been active in the West Coast countries of South America and in Argentina, this marks its first venture into manufacturing operations in Brazil.

•

Caustic, Chlorine: Canadian Industries (1954) Ltd. will triple its current production of chlorine and caustic soda when units now under construction come onstream early in 1956. Site of the expansion: Cornwall, Ont.

CIL's Windsor, Ont., chlorine plant (partly destroyed or rendered unusable by a cave-in earlier this year), is up for sale. Reason: its facilities were deemed "too small" to satisfy market demands.

•

Polystyrene: Bakelite Co., division of Union Carbide and Carbon Corp., will build high-impact polystyrene facilities at Bound Brook, N.J. Other new units already under construction at Marietta, O., should double Bakelite's total output by the end of 1955.

COMPANIES. . . .

Two major Canadian companies in the field of tape and varnish materials have merged. Both firms (Minnesota Mining & Manufacturing Co., London, Ont., and Irvington Varnish and Insulator Co. of Canada, Ltd., Hamilton, Ont.) have head offices of the parent concern in the U.S.

•

New Idria Mining & Chemical Co. has acquired "very substantial uranium claims" on the Navaho Indian Reservation in Arizona. The claims are the maximum allowed for sale by the reservation under the regulations of the Bureau of Indian Affairs.

•

Two new major divisions have been established by the Standard Oil Development Co. by separating its former Development Division into two distinct parts. One, the Chemicals Development Division, will be headed by C. Wesley Tyson; the other will handle petroleum development, will be known as the Petroleum Development Division.

•

Recent company incorporations include:

- Gulf Chemical Co., with listed capital of $10,000, Dover, Del.
- Val Chemicals, Inc., with authorized capital stock of 1000 shares, no par value, Dover, Del.

•

Standard Sulphur Co., Inc. has acquired the sulfur and sulfur rights on some 500 acres in the Allen Dome area of Brazoria County, Tex., from Gulf Oil Corp. and Brazos Oil and Gas Co. Standard will build a $1.5-million sulfur plant on the site designed to produce some 200 long tons of sulfur/day. Completion is scheduled for late 1955.

The agreement provides that after Standard Sulphur has recovered the cost of the plant, 50% of the profits from sulfur sales will be paid to Gulf and Brazos in proportion to their interest in the leases. Brazos Oil and Gas is a subsidiary of Dow Chemical Co.

•

Food Machinery and Chemical Corp. has shifted chemical activities of its Central Research Dept. at San Jose, Calif., to the laboratories of its Chemical Div. in New York City.

•

Officials of Nopco Chemical Co. and National Research Corp. are considering a program whereby National Research would offer its preferred and common stock to Nopco stockholders in exchange for Nopco common stock on a basis of one share of preferred and one-quarter share of National Research common for each share of Nopco common.

•

Devoe & Raynolds Co., Inc. will move its executive offices from New York to Louisville, Ky., on Jan. 3. About 50 executive and supervisory personnel are involved in the transfer.

WIDE WORLD

Delighted with Decision

SMILES APLENTY broke out in Wilmington when Du Pont officials got word of Judge La Buy's decision (*CW, Dec. 11, p. 13*) dismissing the last of the major antitrust suits filed against their company during the past decade. Looking over the 220-page opinion are Irenee du Pont, honorary chairman of the board; Crawford Greenewalt, president; and Walter Carpenter, Jr., board chairman.

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- Color, A.P.H.A. (10g. in 100 ml. methanol) .....10 Max.
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FINISHES: In enamels and other finishes in the form of modified urea-formaldehyde resins . . . in fire-resistant paints.

PAPER: In urea-formaldehyde resins for imparting wet strength to paper and paper coatings . . . softener for glassine paper and similar products . . . ingredient in fire-resistant compositions . . . solubilizer for starch in coatings.

PLASTICS: Manufacture of urea-formaldehyde resin molding compositions.

TEXTILES: In urea-formaldehyde resins to improve crush and crease resistance . . . in acid and direct dyes for screen and roller printing of textiles . . . with starch and other materials for sizing and finishing many types of textiles . . . in flameproofing compositions.

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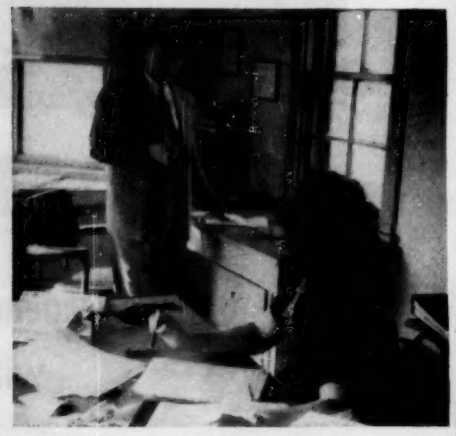


TOO REALISTIC to stack all his chips on his multimillion-dollar harbor enterprise, Pinney spends the average day (after briefing his secretary) checking new units in truck service building . . . looking over preliminary drainage grading at Union Carbide's new $31-million titanium plant . . .

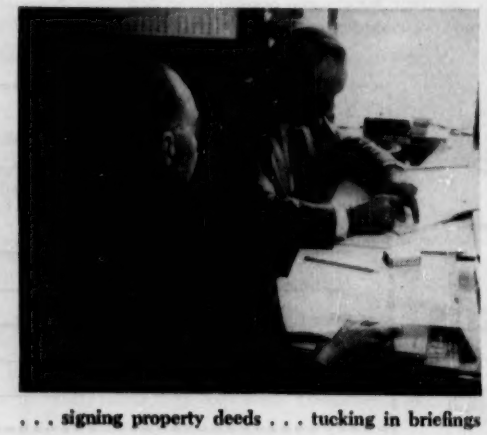
Seaway Sweepstakes Is On

There's bustling up and down Lake Erie's south shore these days as newly appointed dock officials hammer out plans to ready port facilities for the St. Lawrence Seaway. But nowhere is there greater excitement, more rabid rooting than in Ashtabula, O., heart of a rapidly mushrooming chemical community.

Man behind the push (and the man whom leading industrialists are backing to take an early lead in the seaway sweepstakes) is Nelson Pinney, 48-year-old contractor who boasts that he has only a grade-school diploma. The vast projects he has under way (or under study) for Ashtabula's waterfront should easily be able to handle and store up to 4 million tons of limestone, salt and other chemical raw materials by 1957—well within the Seaway deadline.

Caused by Growth: Ashtabula's problem (which Ashtabulans think Pinney will solve neatly) is simply one of growing pains. In 1944, the town was chiefly a coal and iron ore port, feeding some 25% of the ore to blast furnaces in the Youngstown, Warren, Steubenville, and Pittsburgh areas. But in the past 10 years a complex of chemical companies has sprung up—lured by cheap and plentiful water. Such chemical giants as Electro-Met's calcium carbide and ferro alloy plant, National Distillers' chlorine and sodium plant, Hooker-Detrex's trichloroethylene plant, General Tire and Rubber's polyvinyl chloride plant, (opened last October), Archer-Daniels-Midland's $6-million fatty alcohol plant, and Union Carbide's $31-million titanium plant (still under construction) are now forced to rely on costly rail shipments. Simply because of a lack of adequate dock and storage facilities last year alone, the Ashtabula Port Commission

. . . supervising unloading of lime residue . . . chatting with contact . . . handling Dock Co. affairs.



. . . signing property deeds . . . tucking in briefings on whereabouts of trucks . . .

was compelled to turn away an estimated 400,000 tons of limestone, salt, sand, and gravel.

Electro-Met, for example, using anywhere from 200,000 to 400,000 tons of limestone per year, was becoming increasingly worried about its percentage of fines, caused by constant rehandling.* National Distillers Corp. (which makes chlorine, distributes it to other companies in the vicinity) was so eager to cut shipping costs that it conducted exhaustive explorations (without appreciable success) to find workable salt mines in the Ashtabula area. When that failed company officials (through Pinney) managed to lease three old docks—on a month-to-month basis—from New York Central on the eastern side of the Ashtabula River. But the docks were in poor repair with salt continually sliding off unbulkheaded sections into the river. And at best, they could only handle about 45,000 tons/year—slightly more than half the now projected need.

*As a rough rule of thumb, companies figure about 1% increase in fines every time limestone is rehandled.

One Man's Answer: Impressed with the urgency of the situation, Pinney decided to step into the breach. Neither asking (nor receiving) financial backing from the chemical companies concerned, he first worked a parcel-for-parcel deal with the railroad for a stretch of undeveloped land on the river shore; then bought an adjoining plot of 36 acres formerly used as an amusement park.

With land in hand (and quartz slag and fly ash available from Electro-Met as well as lime residue from Hooker-Detrex and wastage from NYC) Pinney was faced with two major jobs. There was the problem of grading and leveling the land area purchased, and constructing two 2000-ft. docks. To build the docks (each approximately 500 ft. wide with 165 ft. slips of water, at present 12-14 ft. deep) immense quantities of fill were essential.

But Pinney wasn't stymied long. First, using his own trucks and grading equipment, he moved some 2.3 million cu. yds. of earth into the area. Then (to shore up his docks) he started to truck into position quartz-formed slag—available from Electro-Met at a rate of 12,000 tons/day.

Net Result: As the harbor project now stands, one dock core (150 ft. wide) has been pushed to its 2000 ft. limit. The other has already been pushed to the 1000 ft. mark. When all filling and grading operations are completed, Pinney will have enlarged his original land purchases of roughly 65-75 acres to 140 acres.

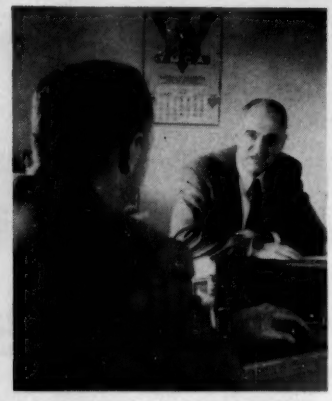
It's obvious, Pinney admits, that when his docks are in operation, the load will be more than a fleet of 35 trucks can handle. So he's at present considering two alternatives. One would be construction of a belt conveyor—to Electro-Met's calcium carbide and titanium plants 1½ miles away. But cost (between $1-1.5 million) is a limiting factor.

The other, an overhead private road,

(this one's headed for Electro-Met) . . . before lunch with bank directors and a fast turn around town.

Story begins on p. 18

ALL OPERATORS deserve a special visit . . . from scrap recovery on New York Central waste contract . . . to National Distillers' salt loading site . . . to bulldozer operators in dock area . . . to flat-bed drivers . . . to rail siding unloaders.



THEN TALKS with officials of NYC, Electro-Met (on harbor dredging prospects) . . .

. . . and Hooker Detrex—all concerning lake front development.

would probably offer greater flexibility of movement.

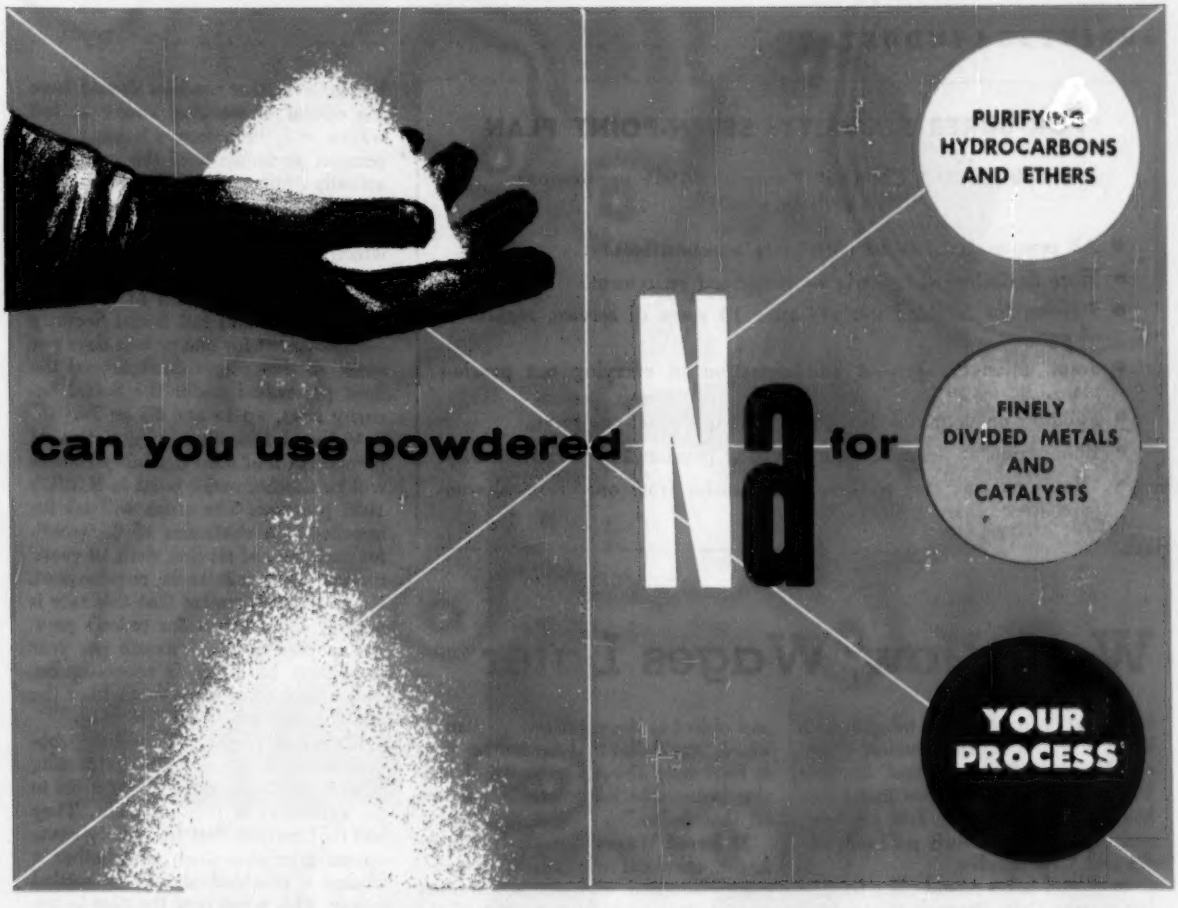
Looking Ahead: Pinney is dreaming about a third 2000-ft. dock equipped with a warehouse for unloading general cargo—such as bulk sugar, manganese ore, raw rubber (for Akron's tire industry), and copra (for the vegetable oil needs of Archer-Daniels-Midland's fatty alcohol plant).

But urgently needed right now to supplement Ashtabula's dock project is a $4.9 million appropriation from the federal government to permit dredging of a turning basin in the harbor and a channel to the docks 25 ft. deep. Congress has granted authorization, but appropriation is still forthcoming.

Chemical companies in the area can be counted on to push the issue. If Ashtabula had a good harbor, Union Carbide, for example, which will produce 7500 tons/year of titanium sponge, could ship much of its required chlorine directly from Michigan and New York plants; and Hooker-Detrex, which makes trichlorethylene, could ship 15,000 tons/year by water at a saving of 90% of rail costs.

Ashtabula city fathers are happy about what Pinney is doing. Not only will his foresight open up an estimated 4000 industrial jobs in the area by 1960, but also the city will have open docks ready for the Seaway opening with no cost to local taxpayers.

Despite all the excitement, however, Pinney hasn't essentially changed. "I started out as a trouble shooter," he says, "and I'm still doing it. If the Seaway went out tomorrow, we'd still be in business."



Atomic layers of metallic sodium can be coated on the surface of finely divided solids such as salt, soda ash, carbon, alumina, metal oxides and sand. The coated solids are free-flowing, can be used in fixed beds or fluidized systems, or can be suspended in hydrocarbons. The amount of sodium present depends on the particle size of the carrier, e.g., carbon black carries over 35%.

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(Goals for AFL Chemical Workers in 1955 negotiations on pension plans)

- All pension plans to be completely noncontributory.
- More flexibility as to early or postponed retirement.
- Pension for disabled workers after 10 years of service, regardless of age.
- Joint union-management administration in carrying out pension plans.
- Funding on actuarial basis, rather than pay-as-you-go.
- Elimination of tie-in between company pension and Social Security.
- "Vesting rights" for workers who transfer from one chemical company to another.

Work Now, Wages Later

Chemical companies that bargain with locals of International Chemical Workers Union (AFL) will find in their 1955 contract negotiations that much heavier stress is being laid on long-range security for hourly paid employees and their families.

Interviewed in his Akron office by *CW* last week, Otto Pragan, the union's patient and persevering economist and research director, sees 1955 as the year in which ICWU will give security—in the form of pensions and welfare funds—at least equal status with wage demands. He's urging ICWU locals to strive during the coming year to have their present pension plans revised or new pension plans drawn up to conform to seven points (*see box, above*) designed to make chemical industry employment more attractive as a lifetime investment for a worker's man-hours.

Such a program would require a considerable outlay for most chemical employers; but Pragan feels that it would be money well and fairly spent. In fact, he believes that management would save money by shifting to noncontributory plans, in which the company makes all payments into the pension fund. For one thing, employers will be able to deduct from taxable income the full amount of their pension payments as business expenses. A second advantage: much lower administrative overhead costs when all th money comes from a single source. Finally, Pragan suggests that employers with noncontributory plans will be able to attract better workers. Employees are beginning to understand and object to the contributory plan, in which "the dollar that the worker pays in buys only about 80¢ worth of pension because he has to pay income tax on that dollar."

Deferred Wages: Practically all the larger chemical companies have already adopted the noncontributory system, Pragan says, but most of the smaller companies so far have stuck to the older method. Those firms will be prime targets for the union next year; Pragan predicts that the noncontributory feature will be the union's paramount issue on pensions, with leeway on retirement dates and pensions for disabled workers close behind. He takes the view that pension payments are really "deferred wages," and that employers therefore have all the responsibility for making those payments.

Wherever such a plan is not yet in effect, the Chemical Workers will seek to establish a flexible system on retirements. First, the union wants all pension plans it negotiates to provide for full pension at age 65, after 10 years' service. Second asking point: granting of a pension—at the option of the worker—at age 55 after 10 years' service, this pension to be actuarially reduced so that it probably would amount to less than half of a full pension. This the union sees as vitally important, not only as a bargaining problem but also as an economic one, because of the increasing number and percentage of older people in the nation's work force.

The union agrees that 65 should be the standard age limit for pensions, but believes that workers should have the option of working longer at full wages, with the company holding back pension payments until the individual actually stops working. The union may be willing to compromise on this issue along the lines of the Baxter plan, which provides that retirement shall come at 65, after which the worker can receive—in addition to full company pension and full Social Security—employment for one or two days per week, so that wages don't exceed the limit prescribed under the Social Security laws, up to age 68 or 70.

Voice in Handling: Negotiation of permanent and total disability clauses will be another major point in ICWU's 1955 program. The union will ask for benefits at a minimum of $3/month for each year of service, with 10 years' service as a minimum requirement. Union officials realize that this rate is notably higher than the union's present average of $1.75/month per year of service, but feel it's necessary because disabled workers don't have the added benefits of Social Security.

Chemical Workers want—but probably won't make it a big bargaining issue in 1955—a much greater voice in the execution of pension plans. They feel that matters that frequently come up on grievance—such as whether a worker is disabled—should be settled jointly. This is not now the case in approximately one-third of the plans now in effect with ICWU locals. There'll be no attempt to take over part of the responsibility for managing the pension funds—the union doesn't want to handle the money, and a company can't get tax exemption unless it turns the money over to an independent trustee. The union feels that with smooth-working joint administration committees, it'll have a much easier job of selling its members on the value of pension plans.

All negotiated plans must be actuarially funded, ICWU asserts. Pragan holds that because of the ups and downs in the economic cycle, a pay-as-you-go plan leaves the worker without any guarantee that he'll get his pension when he's 65. As far as investing the money is concerned, the union prefers—but doesn't have the power to stipulate—that funds should go into trusts, rather than into government bonds or insurance annuities. On low-interest government securities, unionists fear that buying power might ultimately be slashed by inflation. Insurance annuities also return low yields, the union believes, and insurance companies are limited on the type of investments they can make.

Pragan emphasizes heavily that

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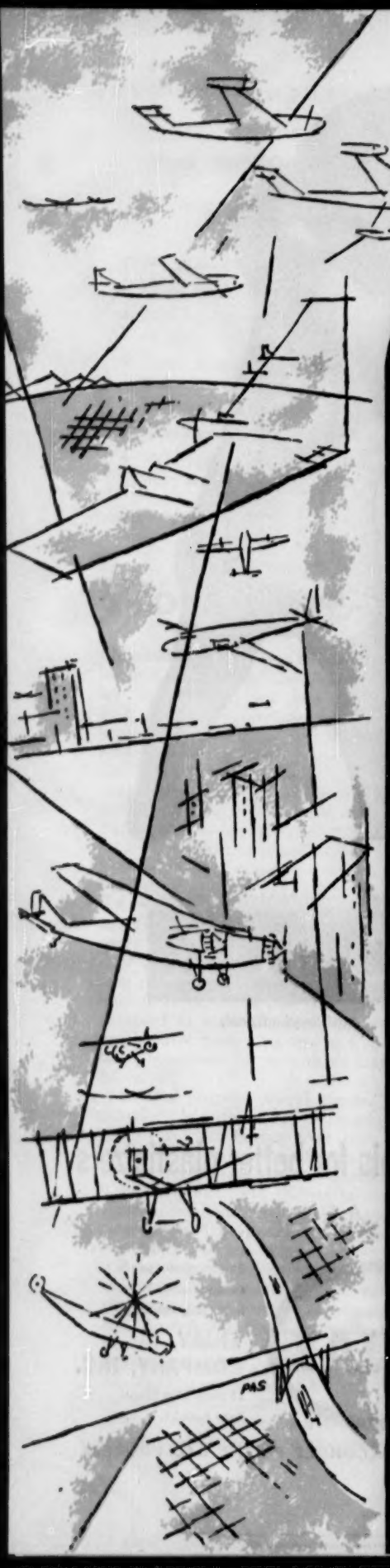

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ICWU'S PRAGAN: In noncontributory pensions, a saving for management?

while pension funds are regarded by his union only as a supplement to the federal government's Social Security system, the two sources of retirement income must be considered separately in negotiations on payment increases. With Social Security's maximum payment now pushed up to about $107/month (from the former $85 limit), ICWU will fight to keep any employer from reducing proportionately the amount of his monthly pension payments. To do that, Pragan declares, would deprive workers of their increased Social Security benefits, for which they're now being taxed at high rates. He says that so far there's been a large measure of cooperation from larger chemical companies in maintaining their regular payments.

Little hope is seen of pushing the "vesting rights" issue next year, although it certainly will be on the agenda. Pragan feels that workers who leave a company before they're eligible to receive a pension have a right to the "deferred wages" that have been set aside for them. Beyond that, he feels that there's a real danger to the economy in allowing large sums to pile up in trust funds. Also, he'd like trustees to be required to put into their periodic financial statements more details about investments.

With the tremendous variance in labor costs among various segments of the chemical industry, Pragan feels that ICWU can't possibly set up a "model pension plan" such as has been standardized in the auto industry. "We must have pension plans tailored to fit the realities in each line of chemical manufacturing," he tells *CW*.

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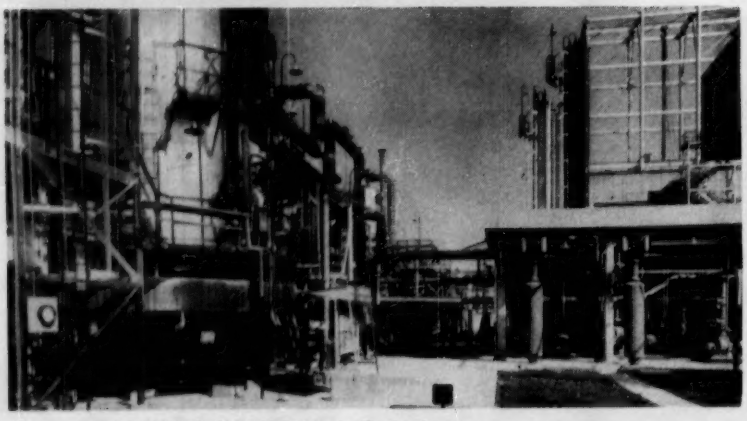

PRESENT FACILITIES: Sadly inadequate in some spots . . .

. . . modern in others . . . but still . . .

Badly in Need of Backing

There's general accord on both sides of the U.S.-Mexican border this week that Mexico badly needs new fertilizer-producing capacity. And most interested industrialists even agree that the ideal plan would be to build a total of three plants (combined cost of $50 million) to increase fertilizer output 600,000 tons/year.

But the big bug in the scheme is how to finance such grandiose plans. Wrestling with the problem, the Mexican government seems almost ready to concede that it will need either (1) a U.S. Export-Import Bank loan (which would mean Mexican government control of the plants), or (2) will have to grant permits enabling a U.S. firm to take charge of the whole expansion program.

Two other possibilities are still open, though. Capital might be lured from Europe, or government officials might be able to swing a loan from U.S. private investment banks.

Meanwhile, however, plans are being laid as to location of the new facilities.

More than likely, the first plant—and most expensive ($20 or 30 million)—will be located at Coatzacoalcos, a gulf port in Mexico's southern Isthmus of Tehuantepec. Later, others are planned for Salamanca in central Mexico, and Matamoros or Monclova, two northern spots. Together they'll provide a logical distribution pattern designed to favor Mexico's important agricultural areas.

Four Willing: U.S. chemical companies reportedly interested in getting in on the Mexican fertilizer expansion program include Olin Mathieson, Phillips Petroleum, Shell, and Union Carbide. But regardless of who gets the nod, there's bound to be considerable government red tape to unravel. For example, some of the preliminary details to be thrashed out with the Mexican government: a permit from the Secretary of Economy, an agreement on output prices, a contract for raw gas from Petroleos Mexicanos.

Moreover, all vying U.S. companies well know that without a raw gas contract from Petroleos Mexicanos (the government's powerful oil monopoly), any chance of building fertilizer plants in Mexico is hopeless.

Further: negotiating the contract could be the roadblock put in the way of interested U.S. firms because Pemex itself is angling for control of the fertilizer plants. Already, it has built recovery units at its Poza Rica oil fields to extract sulfur from sour gas, and lately has been reported considering diversifying into fertilizer production, too.

No Reluctance: Considering these barriers (and past experience with unstable politics and economy), why are U.S. firms willing to venture into Mexico?

Basically, they say, because the "general policy climate" is now encouraging private investment. Mexico today maintains free exchange laws with no limit on removal of profits or invested capital. And further, there's no longer restriction on complete foreign ownership.

On the negative side, it must be anticipated that the Mexican government will probably fix fertilizer selling prices (subject, of course, to future revisions), and possibly will even seek to control profit rates.

That apparently isn't discouraging European companies, though. Snapping hopefully at the bait have been French, German, Swiss and Italian chemical firms. Saint Gobain (France) is not only willing to extend credit, but also will accept 20% stock payment from the company once it is formed. Balance of the money can be paid at 5½% interest in seven years from the plant completion date. Surprisingly enough, this practically matches (in some ways outdoes) Export-Import financing,* may be hard to turn down in favor of the other plans.

Highly Unlikely: Though highly improbable, there's still a chance that private banking interests will get into the Mexican fertilizer race. It would be unusual, however, in the country's capital investment experience. Nevertheless, two U.S. investment banks are currently offering to finance the fertilizer projects.

Right now that's where the situation is hanging. There's no doubt that Mexico needs increased fertilizer production; it's next big agricultural expansion will depend entirely on the government commission's decision on which plan to choose. And likewise there's no doubt that a plump dollar plum is hanging in the balance.

*A $5-million loan from the Export-Import Bank helped finance the country's latest (1950) fertilizer plant *(see cuts)*. Contract for design and supervision went to Chemical Construction Corp.

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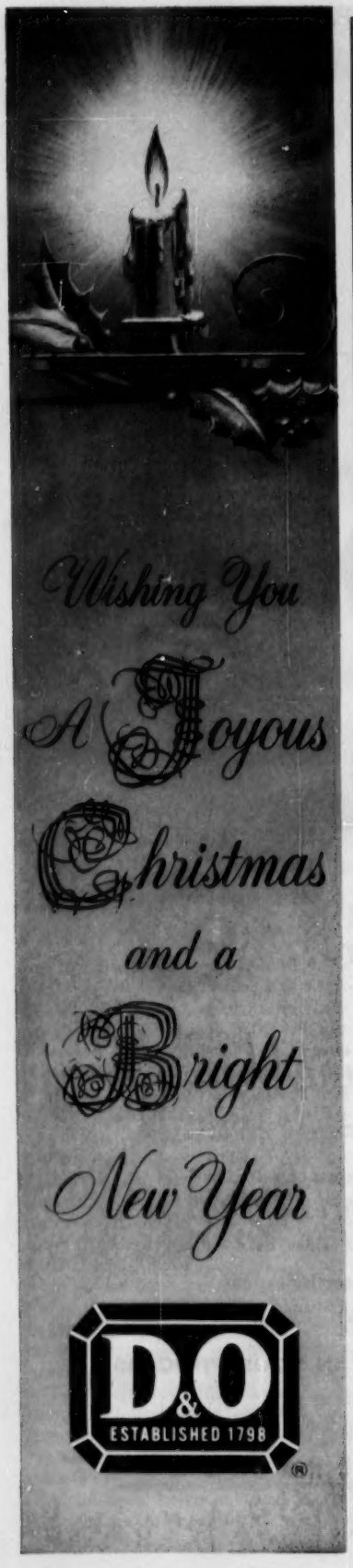

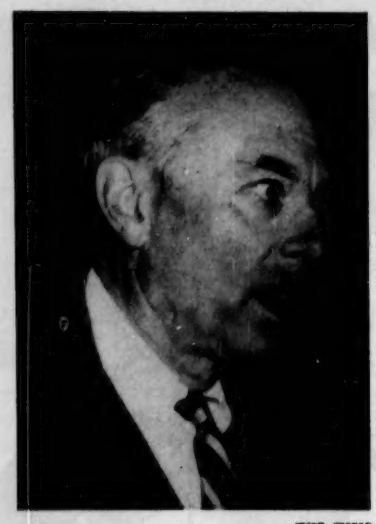

WIDE WORLD

INTERIOR'S WORMSER: In minerals policy, no mention of tariff aid.

Not Their Own Choice

Out last week, the long-awaited report of the President's cabinet committee on minerals policy provides two indications of major concern to the chemical process industries:

- Whether future mineral supplies will be forthcoming in quantity from domestic producers or whether processors will have to rely on foreign mines' output.
- What the present Administration has in mind for other essential industries that may be hampered by foreign competition.

Some of the committee's major recommendations already had been approved and put into effect some months ago. However, these additional suggestions are now on the record:

- Government loans for mining exploration should be continued.
- Tax laws should be periodically reviewed to get rid of "deterrents to the sound development of the nation's mineral resources." This year, Congress voted higher depletion allowance for many metals and minerals. The Administration may now seek additional tax benefits for mining.
- The supply-demand picture for each strategic material should be evaluated periodically to set up "the proper level of efficient domestic production required as an adequate component of the mobilization base." This is a regular function of the mobilization planners.
- Interior Dept. should step up topographic and geological mapping, development of geochemical and geophysical theories and techniques, metals research, and other technical projects related to mining.

Long-range Stockpiles: The committee also recommended that stockpile objectives for most strategic materials be substantially boosted for two purposes: to reduce our wartime dependence on foreign sources of supply and to provide a shot in the arm for ailing U.S. miners, mainly lead-zinc producers.

Last March, the President announced that "long-term" stockpile objectives would be set up over and above basic stockpile goals. As this program has worked out, purchases have been made from domestic mines "to help reactivate productive capacity." Stockpile price-propping has hiked lead prices 20% in nine months, zinc, 24%, the report disclosed.

The President's committee was set up in Oct. '53. Its function: to draft a national policy to aid the depressed U.S. mining industry. Interior Secretary Douglas McKay was named chairman. Other members were Secretary of State John Foster Dulles, Secretary of Commerce Sinclair Weeks, and Defense Mobilization Director Arthur Flemming.

Delay over Tariffs: For the most part, the committee operated on a subcabinet level, Assistant Interior Secretary Felix Wormser holding the reins. Actually, however, Wormser's personal views did not prevail in the committee's proposals.

The report is eight months late, mainly because of a behind-the-scene squabble between Wormser and State Dept. officials. Wormser, a mining man, strongly advocated higher tariffs to aid U.S. miners. State Dept. officials opposed Wormser's views, then got solid support from the Randall Commission's free-trade proposals.

The President's rejection this summer of a Tariff Commission recommendation for lead-zinc tariff increases stemmed from his Minerals Policy Committee's majority stand against tariff protection.

The report itself omits mention of tariff policy. Most mining men will consider this a slap in the face; the industry still advocates tariff relief over any other form of government assistance.

Thus mining companies can count on some help, though probably not the kind they'd choose for themselves. Other industries can expect that most U.S. mines will stay in production; but the signs are clear that the Administration will be hard to convince that tariff protection is a suitable remedy for ailments of domestic industries.

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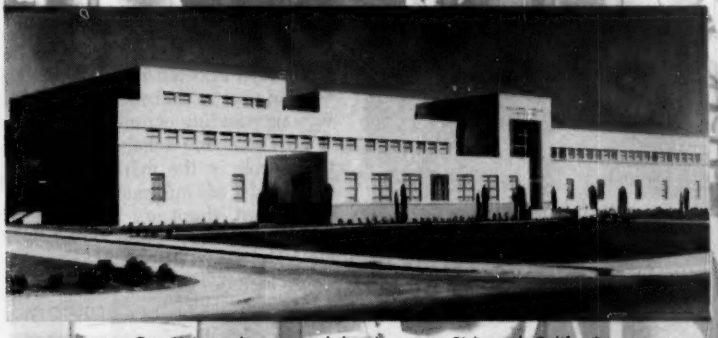

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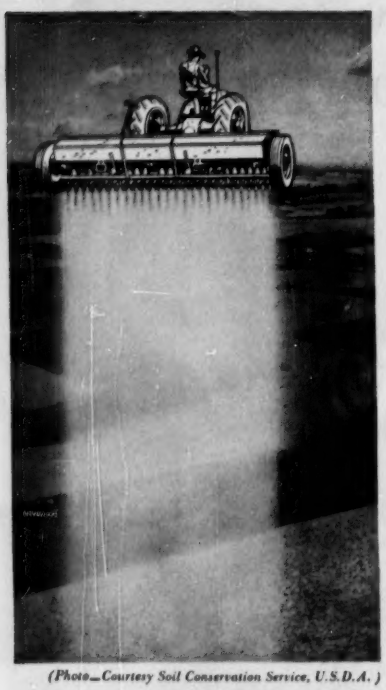

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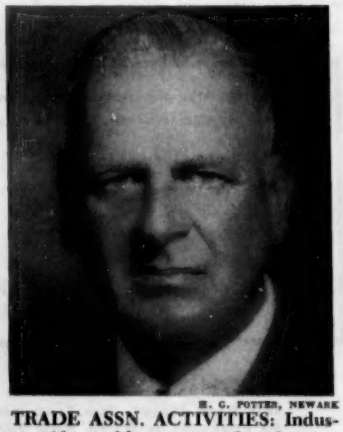
TARIFF: Fred Singer—a full-time tariff specialist—works in Du Pont's development department.

MATAR STUDIO, NEW YORK

LEGISLATIVE: Lawyer and industrialist is James Flanagan, vice-president, S. B. Penick & Co.

UNDERWOOD & UNDERWOOD, NEW YORK

MEMBERSHIP: DCAT is relying on J. T. Baker Chemical's Ralph Clark to help maintain membership standards.



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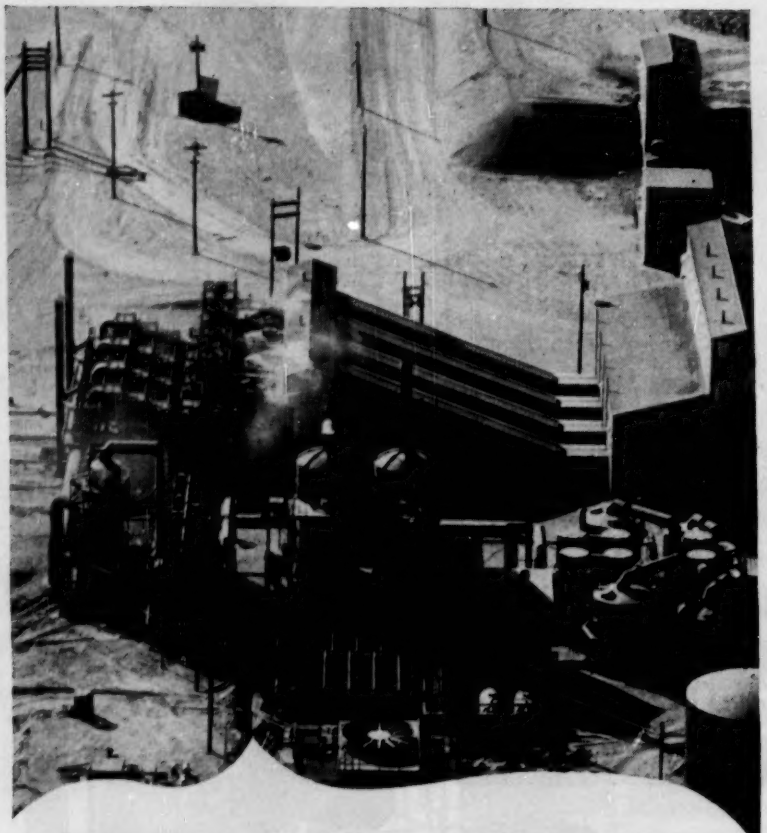

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WIDE WORLD

WATSON: To cut backlog, 130 more examiners.

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Patent Office Snarl-up: The American Patent Law Assn. is disturbed about the number of patent applications piled up in the U.S. Patent Office. More than 204,000 applications now are pending, including some 131,000 awaiting action by examiners; and there were 75,271 new applications in fiscal '54. Patents Commissioner Robert Watson estimates that his staff of 622 examiners would have to be upped to 750 just to keep the backlog from getting bigger.

•

No Open Season: Chemical companies that are incorporated in Delaware are filing away memos about the recent Court of Chancery decision to the effect that there's no "open season" for disgruntled stockholders to browse through corporate records in a hunt for some slip-up on which to base a stockholder's lawsuit. At Wilmington, Chancellor Collins Seitz held that to adopt the approach advocated by plaintiffs in the Albercan Oil Corp. case "would invite the extension of such litigation beyond reasonable limits." He said a corporation is entitled to prevent even its stockholders from engaging in unrestricted record-scanning in search of "something." His ruling blocks the move by a group of Albercan stockholders to obtain information "from which they hope to make out causes of action based on wrongful payments and violation of the corporate opportunity doctrine." The plaintiffs feel that Albercan was not paid enough for sale of certain assets to Canada Southern Oils, Ltd.

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BUSINESS & INDUSTRY. . . . . .

WIDE WORLD

CIO'S KROLL: For election results, his committee gets partial credit.

LABOR. . . . . .

Emphasis on Politics: So heavily is political action being stressed in labor union circles these days that President Elwood Swisher of United Gas, Coke & Chemical Workers (CIO) and other union leaders have been mulling over the point that in Britain, the labor unions have their "own political party" to help fight their legislative battles.

A hint of how the U.S. unions plan to step up their political activities in the future came last week in Los Angeles at the start of the CIO's 16th annual convention. That organization's Political Action Committee—credited by CIO President Walter Reuther with having had much to do with last month's Congressional election results—said that it's looking forward to "even greater success" in the 1956 Presidential election. PAC Chairman Jack Kroll indicated that his committee expects to continue in business in that year, even though it's generally expected that AFL and CIO will be able to agree on merger terms in 1955.

•

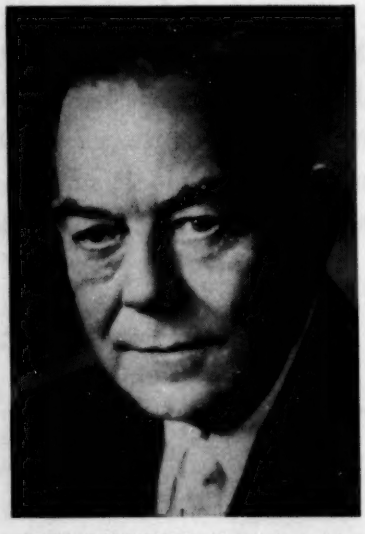
Freedom to Decertify: On paper, at least, it's as easy for plant workers to stop being represented by a union as it is for them to unionize. At the B. F. Goodrich Chemical Co. plant near Louisville, Ky., two small craft units have voted to do just that. The maintenance electricians voted 9 to 4 to drop their affiliations with International Brotherhood of Electrical Workers (AFL), and the instrument repairmen cast seven ballots for "no union," four for Distillery Workers Union (AFL).

•

Texas Wages Unchanged: No wage increase was provided in the series of union contracts signed last week by chemical and petrochemical firms around Port Neches, Tex. Only significant changes in the new pacts: a company-paid hospital, medical and surgical plan in agreements with U.S. Rubber Co.; and plant seniority instead of departmental seniority in the contract between Goodrich and Oil Workers International Union (CIO).

•

Industry Expectations: Some of the labor developments that industry can look forward to or watch out for next year were covered in talks at the 59th annual Congress of American Industry, convened in New York's Waldorf-Astoria by the National Assn. of Manufacturers. Walter Chamblin, Jr., of NAM's Washington office, discussed the outlook for governmental action on the Taft-Hartley Act and the minimum wage law. (It's been rumored that Labor Secretary James Mitchell is about to advocate a 10¢ or 15¢ increase in the present 75¢/hour minimum wage, and an 8% increase in coverage so that this law will apply to about 26 million employees.) Minneapolis-Honeywell Regulator Co.'s Gerry Morse lambasted as "pure nonsense" the idea that a company can "guarantee" employment or pay. He drew support from NAM board chairman Charles Sligh, Jr., who declared that "the guaranteed annual wage has too many structural defects; it can destroy a business."



NAM'S CHAMBLIN: On federal labor front, he watches all sectors.

ATLAS chem-memos

CHEMICALS DEPARTMENT
Atlas Powder Company
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How to save money by buying and storing sorbitol in bulk

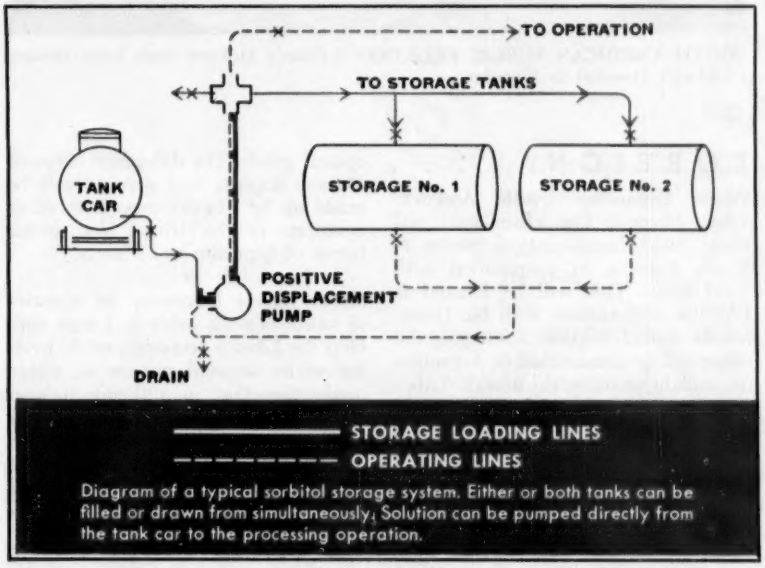

Diagram of a typical sorbitol storage system. Either or both tanks can be filled or drawn from simultaneously. Solution can be pumped directly from the tank car to the processing operation.

PURCHASING sorbitol solutions—Sorbo®, Sorbitol Special or Arlex®—in tank car lots offers several specific sources of savings. First, you save $880 per tank car (88,000 lbs.) on the material itself, because of the lower bulk price in comparison with carload lots of drums.* Equally important, the costs of handling are sharply reduced by switching to bulk storage. Handling can be completely mechanized, warehouse space formerly required for full and empty drums can be put to productive use, and paper work and inventory labor are substantially reduced. More complete utilization of material is obtained, for tank cars can be thoroughly drained more readily than drums.

Tips on storing sorbitol solutions

Anyone accustomed to handling bulk chemicals will find sorbitol relatively simple to store. It is non-corrosive and non-inflammable, does not decompose in storage. It is relatively unaffected by high humidity storage conditions, picking up less moisture than other common polyols when left exposed. It is compatible with other polyols, sugar solutions, sulfonated oils, etc. and may be mixed with such materials in storage if desirable. Since it is non-volatile, it creates no vapor problems.

Choosing materials. The choice of material for storage tanks and piping is determined by the length of storage, degree of purity required, and installation cost. The following is the usual order of preference of materials:

1. Stainless steel (solid or clad)
2. Aluminum
3. Tanks coated with a protective resin
4. Tanks protected with a suitable lining of tin, glass, rubber, etc.

The use of iron piping and tanks, while satisfactory in some plants that use large quantities of sorbitol, is not usually recommended since sorbitol, like many organic materials, will eventually "scour" the inside of an iron tank. This may lead to absorption of iron oxide and some discoloration.

At the Atlas plant, we use stainless steel storage tanks, and ship in stainless steel or aluminum tank cars.

Preventing thickening in winter. Like many other solutions, sorbitol solutions thicken at low storage temperatures, and the highest purity solution, Sorbo®, will tend to crystallize in addition to thickening. For ease of handling, all sorbitol solutions should be kept at 70°F. or higher. This can be accomplished readily by circulating hot water through submerged heating coils of stainless steel or aluminum. Low pressure steam can be used provided reasonable precautions are taken to avoid prolonged localized overheating. If crystallization occurs, the solid sorbitol redissolves on heating, without affecting quality.

Pumping sorbitol. A positive displacement pump made of stainless steel or aluminum is recommended for withdrawing sorbitol from the tank car. Centrifugal pumps can be used, when viscosities are below 100 cp. If facilities are available, the car can be "blown" instead of pumped. Viscosity data for pumping is listed in the table below.

	SORBO	SORBITOL SPECIAL	ARLEX
Viscosity cp. @ 77°F.	Approx. 110	Approx. 300	Approx. 2200
Specific gravity @ 77°F.	Approx. 1.30	Approx. 1.32	Approx. 1.35

Your local Atlas sales representative will be glad to work with you on your specific storage problem. For further information on prices and characteristics of the various sorbitol solutions, write to Atlas today.

*Based on present prices, subject to change without notice.

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2. Works in alkaline and acidic solutions of varying pH; also in aqueous and alcoholic solutions.
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Produced under rigid physical and chemical control, Federated Zinc Dust has 97.0% minimum metallic zinc content; iron content .01%, lead .20% maximum. It will all pass through a 100 mesh screen; 97.0+% through a 325 mesh screen.

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You can have a free half-pint sample of Federated Zinc Dust for testing as a reducing agent. Just write on your company letterhead to Dept. CW at address below. Investigate it, too, as a catalyst and as a polymerizer.

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American Smelting and Refining Company
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SOUTH AMERICAN PUBLIC RELATIONS: Pfizer's McKeen visits Leon Becerra Children's Hospital in Ecuador.

FOREIGN . . . . .

Pfizer Expansion / South America: Chas. Pfizer & Co. (Brooklyn) will build two pharmaceutical plants in South America in cooperation with local firms. One will be located in Chile (a joint venture with Bio Quimica de Rafael Budink, Santiago); the other will be constructed in Argentina (in collaboration with Brandt Laboratories, Buenos Aires). Key technical personnel of each plant will be trained in Pfizer plants in Brooklyn, Groton, and Terre Haute, Ind.

•

Cold Rubber/West Germany: Chemische Werke Huels AG (Marl) is now operating a pilot plant producing cold rubber. Company officials anticipate that early in 1955, the firm will have completed work on a semicommercial polymerization plant, enabling it to supply large samples of cold rubber to West German consumers.

•

Lubricants/Argentina: The Argentine government has authorized Esso Refinadora Petroleo S.A. to build a 60,000-cu.-meter/year lubricants plant. Estimated annual saving in foreign exchange when the plant is in production: $8 million. Both foreign and national raw materials (oil, solvents, sulfuric acid) will be used.

•

German-Finnish Trade: A trade agreement, signed recently in Berlin, provides for Finnish exports of about $18.25 million to East Germany next year. Finland in return will import goods valued at $20 million from East Germany—principally chemicals and optical goods. The difference between Finnish imports and exports will be made up by Finnish exports to other countries in the Soviet bloc under terms of tripartite trade pacts.

•

Sulfur/Libya: Discovery of a series of sulfur-bearing lakes in Libya may help the Libyan economy, while leading to an unusual process of sulfur production—that of utilizing natural bacteria. Sulfur from lakes, Libyan government spokesmen say, could be delivered to Bengazi at a much lower cost than that presently imported for use in dressing vines. Anticipated capacity: 200 tons of sulfur annually.

•

Fertilizer/Australia: North Queensland Fertilizers and Chemicals, Ltd. (Cairns) will bring its £300,000 fertilizer plant onstream before the end of December. North Queensland's full requirements for both sulfuric acid and superphosphates will be satisfied by the new capacity.

•

Fertilizer/Japan: As part of its Industries Rationalization Policy, officials of the Ministry of International Trade and Industry in Tokyo have drafted a five-year plan aimed at expanding capacity to meet Japan's current needs for fertilizer. Tentative approval has already been received from the executive staff of MITI. Over-all plans include:

- Boosting annual capacity from 2.9 million tons (1953's capacity) to 3.6 million tons by 1958; output, from 2.4 to 3.2 million tons.
- Investing 21.8 billion yen (part government loans, part private cash).

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- lubricating oil additives
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Years Ahead

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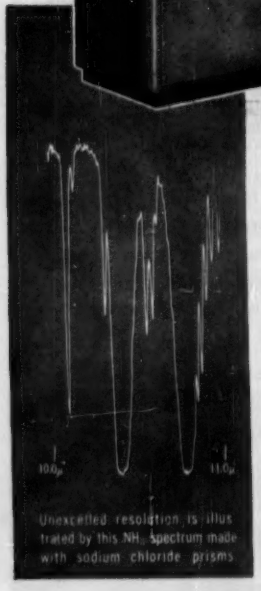
For those who require the utmost in accuracy and resolving power, the Beckman Model IR-3 is the unquestioned choice. Experience has shown conclusively that the IR-3 outperforms all commercial instruments with respect to resolving power, photometric accuracy, wavelength accuracy, freedom from stray light and elimination of background absorptions.



Unexcelled resolution is illustrated by this NH_3 spectrum made with sodium chloride prisms

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Background absorptions eliminated. The entire optical path of the IR-3 can be evacuated to completely eliminate background absorptions from water vapor and carbon dioxide. Liquid and gas cell compartments in both entrance and exit beams are separately sealed so that cells can be changed without affecting the vacuum in the rest of the system. All optical elements and samples are held at a constant temperature by means of circulating water and thermostat-controlled bath.

True transmittance recording through Memory Standardization. No cell matching. Wavelength accuracy, 5 mμ; wavelength precision, 1 mμ.

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Beckman *division*

BECKMAN INSTRUMENTS, INC.
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KINTNER: Judging from early returns, his survey seems . . .

Well Worth the Effort

Officials of the Federal Trade Commission revealed last week that preliminary returns on a checkup of compliance with some 4000 outstanding FTC orders have turned up many violations. Though a good number are of a technical nature and can be corrected through negotiation, spokesmen maintain that others are serious enough to merit penalty actions in Federal Court.

The progress report on FTC's compliance survey was made by general counsel Earl Kintner. Kintner says his survey staff has been processing about 100 cases a month since last July—almost all involving formal FTC orders issued prior to 1947.

Credit for launching the survey goes to FTC Chairman Edward F. Howrey on recommendation of a special committee assigned soon after Republicans assumed control of the commission.

Cross-Checking, Too: Two other checks—part of FTC's over-all plan to put teeth in compliance orders—are nearing completion, too. Both were started last summer—one by a special advertising survey task force checking for false and misleading advertising in periodicals and on radio and television; the other, by FTC field investigators looking into cosmetic manufacturers' pricing schedules, promotion allowances and demonstrator services that are offered to wholesalers and retailers.

Though no definite deadline has been set for the packaged results, Washington observers are predicting that the axe may fall—perhaps sooner than offending companies expect.

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☐ Use of Pelargonic in High-Baked Enamels

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B & I . . . . . .

Flare-up over Foams

If you're licensed to make isocyanate foam plastics under Lockheed patents, do you also need to be licensed under Du Pont's patent No. 2,282,827?

That's the point Nopco Chemical Co. hopes will be cleared up in a lawsuit pending in U.S. District Court at Newark, N.J. (*CW, Nov. 20, p. 32*). In its reply to Du Pont's complaint alleging infringement of the Du Pont patent, Nopco denies that it has committed any infringement and asserts that the Du Pont patent is invalid because of prior knowledge about polyurethanes.

Nopco—a licensee under patents of Lockheed Aircraft Corp.—says the U.S. government has been the most important customer up to now for its isocyanate foam plastics. In an 18-page answer and counterclaim, Nopco is asking the court to dismiss the suit, declare the Du Pont patent invalid and not infringed, and enjoin Du Pont from cutting off, or threatening to cut off, the supply of organic diisocyanates as a means of inducing anyone to buy a license. Nopco tells *CW* that after 2½ years of development work, its foam products are "well advanced in many practical applications"; adds that an "intensive study" of the patents shows that the Du Pont patent doesn't cover these applications.

KEY CHANGES. . .

Sydney T. Ellis, to executive vice-president, Commercial Solvents Corp., New York City.

Herman N. Woebcke, to chief engineer, Mobay Chemical Co., St. Louis.

George Rieveschl, Jr., to scientific assistant to the president, Parke, Davis & Co., Detroit.

Henry W. Gadsden, to vice-president, Merck & Co., Inc., Rahway, N.J.

John G. Bill, to vice-president and general manager, Sharp & Dohme Div., Merck & Co., Inc., Philadelphia.

Henry J. Coleman, to sales manager, Petrochemical Dept., Standard Oil Co. (Ohio), Cleveland.

William F. O'Brien, to manager, lithium sales, American Potash & Chemical Corp., Los Angeles.

L. R. Modlin, Jr., to field sales manager, B. F. Goodrich Chemical Co., Cleveland.

Max Tishler, to vice-president for scientific activities, Chemical Div., Merck & Co., Inc., Rahway, N.J.

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6 additional plasticizers

DI OCTYL PHTHALATE-HR — A specially prepared DOP of particular interest to wire and cable insulation manufacturers requiring a high, uniform, volume resistivity.

ISO OCTYL-ISO DECYL PHTHALATE — A carefully prepared blend of octyl and decyl phthalates which imparts superior low temperature and low volatility characteristics to vinyl plastics.

DI ISO DECYL PHTHALATE — Recommended in vinyl plastics to improve low temperature and low volatility characteristics.

DI ISO OCTYL ADIPATE — A standard low temperature plasticizer used in vinyl plastics where durability at low temperatures is a requirement.

DI ISO DECYL ADIPATE — Shows promise as a low cost replacement for di octyl sebacate. Low temperature and electrical characteristics are very close to those of di octyl sebacate.

DI OCTYL SEBACATE — A practically water white, premium quality, low temperature plasticizer which can be supplied with a color of less than 100 on the APHA scale.

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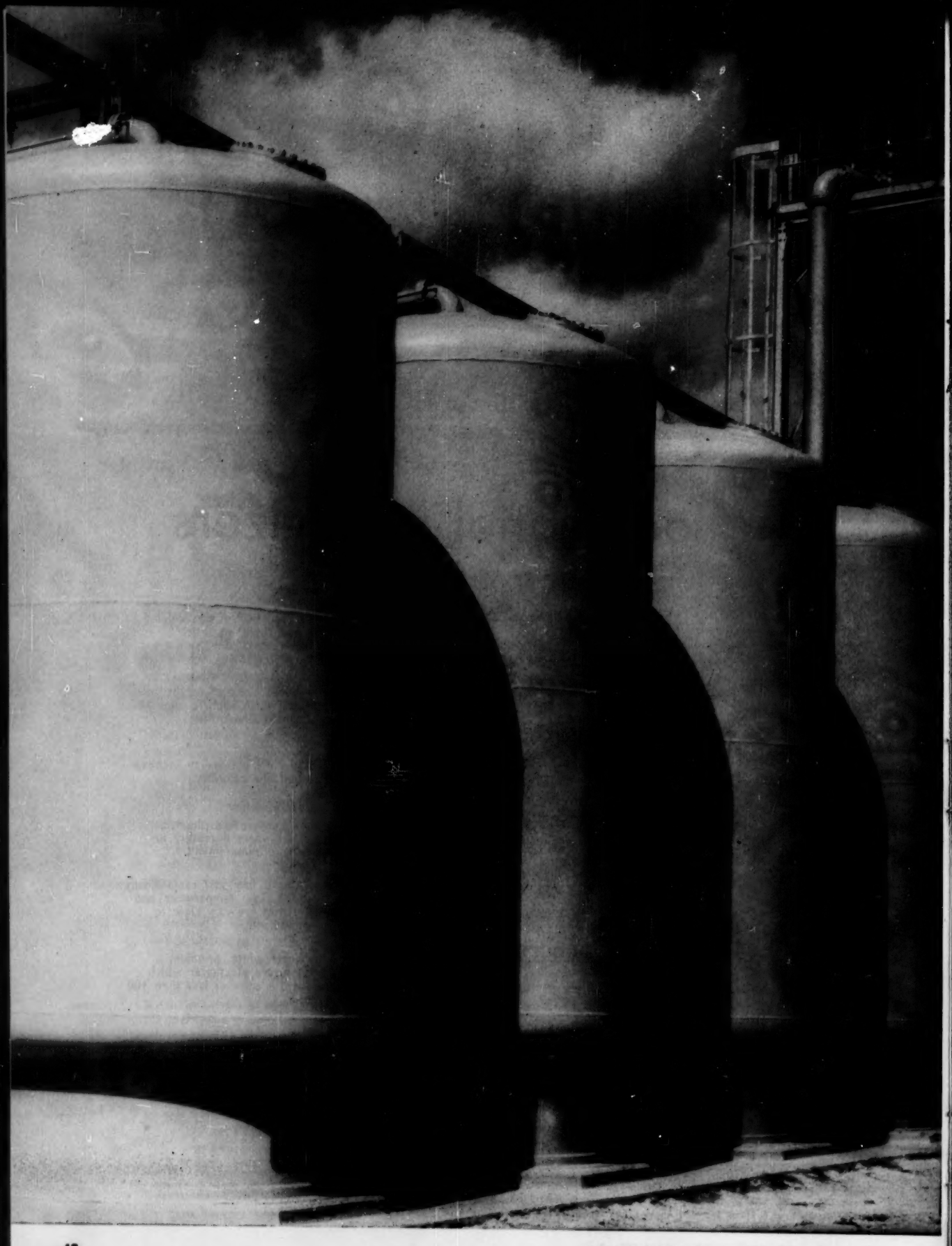


C W Report

by Albert Mindler and C. Frederick Paulson

Ion Exchange: Unit Operation on the Move

Ion exchange is gaining muscles. To be exact, it has put on about $40 million worth in the last 15 years.

The big outlet is still for water conditioning, but other fields are gaining ground.

Here's a rundown on who's in it, where it's used and headed, a brief resume of what you should know about the field.

Seldom in chemical history has a so-called new unit operation received such intense interest in so short a time as has ion exchange during the last 15 years. Limited originally to water treatment, it has been developing rapidly beyond this field because of its versatility and applicability to problems that heretofore had no satisfactory solution. The sales of ion exchange materials and equipment by a dozen companies in the industry now exceeds $40 million/year.

Development of new types of ion exchangers with improved chemical properties has made practicable many processes formerly considered impractical. New techniques have made ion exchange more efficient and ion exchange reactions more complete. New economic or supply conditions have changed the old picture in many instances to make ion exchange attractive for commercial utilization where formerly this unique operation was not justified. In addition to the use of ion exchangers for removing impurities present in low concentrations of solution, ion exchange is now an accepted process of removal of specific ions in the presence of surprisingly large concentrations of other ions.

Ion exchangers are now being used under conditions that caused rapid deterioration of earlier materials. They can stand up under highly oxidizing

Meet the Authors

ALBERT MINDLER (*right*) and Fred Paulson (*left*) are both with the special applications department of The Permutit Co. (New York City) where they do development work on ion exchange applications for fields other than water treatment.

Mindler, a chemical engineer from Lehigh University, worked for Celanese before joining Permutit in 1943.

Paulson came to the firm in 1947 directly from Princeton, where he received both his master's and his bachelor's degrees in chemical engineering.

C W Report

or reducing atmospheres, elevated temperatures, strongly acid or alkaline environments. Certain ion exchangers have been found safe and effective for ingestion as chemotherapeutic agents in the treatment of various bodily disorders such as edema, stomach ulcers, as diagnostic aids, and in geriatrics. These improved materials promise even wider vistas for ion exchange.

Moreover, ion exchange is coming to the forefront as a research tool and in analytical chemistry. The relatively recent discovery of new elements of the actinide series has been facilitated by ion exchange used to separate these elements. Difficult separations or purifications of amino acids, nucleic acids, rare earths and even isotopes are now accomplished by ion exchange. As might be expected, this utilization of ion exchange in the laboratory has frequently led to a rapid acceptance of its capabilities for large-scale operations.

Where They're Used

Water conditioning has been the most extensive use of ion exchange and will likely continue to be. It's estimated that 95% or more of all installations are in this field. This is true both because of the tremendous volumes of water used and because of the peculiarly well-adapted properties of ion exchangers for removing the dilute but harmful impurities that occur in water. Ion exchange offers a convenient, economic, reliable and flexible method of conditioning water to obtain practically any quality required. Among the processes used:

- Cation exchange zeolite softening: Exchange of sodium for calcium and magnesium ions produces soft or so-called zero hardness water. Inorganic cation exchangers and cation exchangers of the sulfonated coal or resin type are employed; salt is the customary regenerant. This market for ion exchangers and equipment for this treatment approximates $18 million annually. It includes household softening, low-pressure boiler water treatment, and process water for a variety of purposes, such as laundries, textile dyeing, rayon processing, and chemical manufacture.

- De-alkalizing: Exchange of hydrogen ions for metal cations forms the corresponding acids from the salts present in water. Since the ions generally contributing alkalinity to water are carbonate or bicarbonate, the formation of the free acids permits the resulting carbonic acid to be readily stripped from the water by blowing with air. The water is then neutralized and can be used for boiler water, process water or ice making. This reduces the total solids, potential corrosiveness, and scale-forming properties of the water. Cation exchangers of the sulfonated organic type regenerated with sulfuric acid are the most popular. Sales volume for this application is less than $1 million annually.

- Split treatment: Parallel operation of the two processes above, followed by degasification, removes hardness and carbon dioxide. This provides a water of low alkalinity and reduces the total solids. It's used for boiler water and process water applications. Estimated volume of sales is $2 million annually.

- Demineralizing (without silica removal): A two-step process, this utilizes exchange of hydrogen ions for metal cations to form acids from salts, followed by acid removal by an anion exchanger. It is sometimes preceded or followed by decarbonation. Acid-regenerated sulfonic-type cation exchangers are employed for the first step and alkali-regenerated weakly basic anion exchangers for the second step. This process is customarily used in the preparation of water equivalent to singly distilled water for boiler feed, process water, metal-plating operations, synthetic-fiber manufacture and a host of other processes requiring cheap water comparable to that produced by distillation. Estimated annual sales volume: $6 million.

- Demineralizing (with silica removal): This differs from the above in that a strongly basic anion exchanger regenerated with caustic soda is employed so that silica and bicarbonate ions as well as mineral acids are removed. Chief use is for make-up of high-pressure boiler water. Estimated annual sales volume is $5 million.

- Mixed bed demineralizing: Combination of the ion exchangers described above, when intimately mixed in a single vessel, turns out an extremely low solids or "conductivity" water. The intimate mixture provides a result comparable to an infinite series of alternate cation and anion exchange units so that even last traces of ions can be removed. Regeneration of a mixed bed, however, is somewhat more complicated than regeneration of two single resin beds, because the two materials must be separated before regeneration. This is done hydraulically by backwashing, which takes advantage of the difference in the specific gravities of the two resins. The cation exchanger is the more dense and therefore separates as a layer below the anion exchanger. The separated beds are then regenerated and rinsed in place through individual distributors placed above, below and at the interface of the ion exchanger beds. Finally, the two beds are remixed by air to provide an intimate mixture and placed in service for demineralizing water. Such water is used for television tube manufacture, synthetic-fiber production, high-pressure boilers, and other industries requiring highest quality water. Estimated sales volume annually is $3 million.

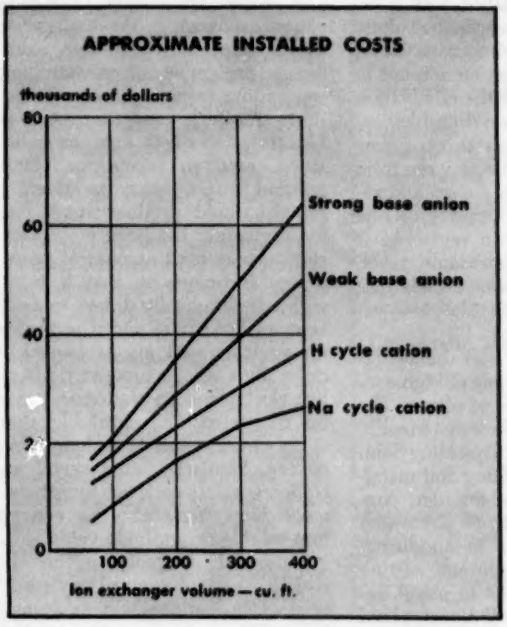
- Salt cycle anion exchange: An anion exchanger in the salt cycle is used to substitute chloride ions for other anions in water. This effectively de-alkalizes water without the use of acid. Normally, it is combined with zeolite softening to produce sodium chloride in the water in exchange for the other ions. Most applications are in small boiler water plants or in places where the use of acid is undesirable and de-alkalizing is necessary. Estimated annual sales volume: below $1 million.

Variations on these methods, coupled with other methods of water treatment, such as hot or cold chemical precipitation, followed by zeolite softening, are so widespread as to make any general recommendations for treatment of types of waters almost valueless. Experience and economic surveys are necessary to determine which of the many treatment methods is most economical and suitable for any given raw water to produce the necessary quality at the lowest over-all cost under the operating conditions prevailing.

Water shortages are increasingly serious in many locations. Ion exchange is gaining stature as a means of reclaiming waste waters. Any of the above described processes may be used, depending upon the service. For example, a once-through cooling water (widely encountered and generally the largest water consumer in a plant) can be softened and then recirculated many times. Also, many plant water wastes contain valuable constituents that can be removed and recovered simultaneously.

Sugar Refining: One of the earliest applications of ion exchange outside the field of water treatment was in the refining of sugars. As long ago as 1908,

ION EXCHANGE: INVESTMENT AND OPERATING COSTS



Approximate Operating Costs . . .

in dollars/lb.-equivalent of ion removed

Na cycle cation exchange	$3.81
H cycle cation exchange	7.31
Weak base anion exchange	5.80
Strong base anion exchange	15.25

Basis:

Fixed charges .. 15%/year on installed cost

Chemicals

Sodium chloride	1.50¢/lb.
Sulfuric acid	1.70¢/lb.
Soda ash	2.25¢/lb.
Caustic soda	4.50¢/lb.

Labor $1.75/hour

Approximate Rated Capacities of Ion Exchangers

Na cycle (sulfonated polystyrene)	7.5 lb.-equivalent/100 cu. ft.
H cycle (sulfonated polystyrene)	3.5-6
Weak base anion	5.5
Strong base anion	3.5

HOW TO USE THE COST DATA

Because of the many variables, costs of installing and operating ion exchange equipment are, of necessity, only approximations. The above information, however, can be used to indicate the economies of installing a unit. Take a hypothetical case of nickel recovery from a plating rinse bath. Assuming a flow rate of 140 gal./minute for two shifts (total of 16 hours), a density of 8.33 lb./gal. at a nickel concentration of 150 ppm., you find the recoverable quantity of nickel is

$$\frac{140 \text{ gal.}}{\text{min.}} \times \frac{60 \text{ min.}}{\text{hour}} \times \frac{16 \text{ hour}}{\text{day}} \times \frac{8.33 \text{ lb.}}{\text{gal.}} \times \frac{150}{1 \text{ mil.}} = 168 \text{ lb./day}$$

Dividing by the equivalent weight of nickel, you get a result of 5.73 lb.-equivalents of nickel. Then multiplying this by the operating costs (for hydrogen cycle) of $7.31/lb.-equivalent yields a total operating cost of $41.80/day.

The rated capacity table indicates a capacity of 3.5 lb.-equivalents/100 cu. ft. Thus the required quantity of cation exchanger involved would be

$$\frac{5.73 \text{ lb.-equivalents}}{3.5 \text{ lb-equivalents/ } 100 \text{ cu. ft.}}$$

or 164 cu. ft. This translates to an equipment cost of $20,000 for one regeneration per day, or $13,000 (82 cu. ft./cycle) for twice-a-day regeneration.

On the assumption that the nickel can be recovered in the form of a concentrated acid sulfate solution that can be returned directly to the electroplating tank, a reasonable value for the solution ($NiSO_4 \cdot 6H_2O$) would be 30¢/lb. That means a total value of $0.30 x 168 x

$$\frac{262.7 \text{ (mol. weight of the sulfate)}}{58.69 \text{ (atomic weight of nickel)}}$$

or $225.60/day.

By subtracting the operating costs from the value of the product, you find the operation would show a net gain of $183.80/day. The investment cost for a once-a-day regeneration would thus be paid off in 104 days, while the investment for the smaller unit would be paid off in 70 days. Obviously, this would be an attractive venture.

C W Report

Harm suggested that a calcium zeolite be used to remove the melasogenic (molasses-forming) alkali metal ions. Unfortunately, because the calcium salts thus introduced had a tendency to form scale, this suggestion received only limited commercial application. It wasn't until the demineralization process was developed that the sugar industry had a means of removing all of the salts and some of the organic impurities from the sugar juice.

And since then, virtually every type of ion exchange process has found gainful employment outside of water treatment—either for purification, separation, or metathesis, or even as catalysts.

Metals and Hydrometallurgy: Copper and zinc are being recovered from rayon plant wastes and various metal surface finishing processes on a large scale by ion exchange. These metals are usually present as cations in acidic or neutral solutions. Passage of such solution through a cation exchanger in the hydrogen cycle results in the substitution of hydrogen ions for the metallic cations. The effluent is usually sent to waste since it contains a considerable quantity of low-value acids and salts. Then, for regeneration, a strong sulfuric acid solution is introduced to drive out the metals in a more concentrated form. Several segments of regenerant (recycled from previous regenerations) are used in order of increasing free-acid concentration and decreasing metal content. The final segment of acid contains no metal. The concentrated elution or regeneration effluent using this recycling process is a solution of 10% or more metal salt with low concentration of free acid while the influent may vary in metal content from a few ppm. to several thousand. So the regenerant effluent may represent up to several thousand-fold concentration.

During the war, Germany had two large cation exchange installations for copper recovery from textile wastes. These are reported to have recovered more than 10 tons of copper per day. An installation in this country consists of four 10-ft.-diameter units using a sulfonated coal cation exchanger and recovers about 800 lbs./day of copper.

Several viscose rayon companies have been studying zinc recovery from rinse waters—the zinc resulting from hardening baths. One plant using a sulfonated polystyrene cation exchanger has been installed with a capacity for about one ton of zinc sulfate per day. Estimated savings after labor, chemicals and amortization amount to $40/day in addition to the elimination of a serious waste disposal problem.

If other rayon manufacturers follow suit the installation value may run from one-half to one million dollars and recover 10 tons or more per day of zinc sulfate. Very little resin replacement is anticipated, although some rayon wastes contain organic materials that may eventually poison the ion exchanger.

Metal cations are also being removed from acid solutions of high concentration in a number of plants. The metals removed include iron (from 20 to 35% phosphoric acid pickling solutions used in steel finishing and metalworking industries); aluminum, copper and chromium (from 5 to 40% chromic acid solutions in anodizing, hard and decorative chrome plating and stripping operations in metal finishing). About 25 installations valued at over $750,000 installed costs have been made for treatment of such acids. Experience has shown that little replacement of the sulfonated polystyrene cation exchanger is necessary. Perhaps double this number will be installed in the next few years.

Metal cations can even be removed from relatively concentrated solutions of strong acids. Zinc and copper, for example, may be removed from 1 to 2% sulfuric acid solutions by sulfonated polystyrene cation exchangers, and such processes should be useful in brass mills and other metal-finishing operations.

In the field of metal finishing, particularly in anodizing, cation exchange is employed to purify the chromic acid bath. In the same field, anion exchange commands a potential market of several million dollars, partly as a solution of a problem of disposing of a toxic waste, and partly as a means of recovering metal values. The problem arises from the rinse water that results from washing the product being finished. It contains a considerable amount of chromic acid.

By passing the water through an anion exchange column, treaters remove the chromic acid before the water is reused. Then after the anion exchanger becomes exhausted, the absorbed chromic acid is regenerated with caustic soda to form the sodium chromate. This solution is sent through a hydrogen cation exchanger where the chromate is converted back into acid. Then the acid—concentrated by evaporation if necessary—is returned to the treating bath.

A novel application of hydrogen cation exchange is the conversion of the sodium salts (soluble salts of metals, present as anions) into the corresponding insoluble acids. Thus, sodium silicate is converted into insoluble colloidal silicic acid or colloidal silica, used in textile manufacture, nonskid waxes, water treatment and foundry mold production. A duplex ion exchanger has been employed for this purpose for a number of years. Its design is unique in that it is fitted with a hydraulically driven rotary surface washer whose jets of water break up agglomerated ion exchanger particles. By a similar process, tin in alkaline electrolytic tin plating wastes may be converted into insoluble stannic acid, which settles as a sludge for recovery. Similarly, other metal anion complex salts, such as tungstates or molybdates, may also be converted into soluble or insoluble acids.

Industrial Organics: The most widely used acid removal process other than water demineralization, at least in terms of amount of product treated, if not in terms of the size and number of units in service, is the removal of formic acid and traces of other organic acids from formaldehyde solutions.

In the oxidation process by which formaldehyde is manufactured from methanol or hydrocarbons, a by-product oxidation turns out other compounds, primarily formic acid. And during storage or shipment, another small quantity of formic acid is formed. Anion exchange is applied very widely for the removal of this acidity. The anion exchange resin however, must have special characteristics to withstand the solvent action and the elevated temperature often required to prevent formation of paraformaldehyde at high concentration. It is regenerated with either soda ash or caustic soda.

Initial investment for this job is small, probably about $150,000 for the entire industry, which employs about 20 units.* And operating cost for alkali and resin replacement amounts to less than 2¢/100 lbs. of the deacidified product.

Application of formic acid removal is an interesting example of technological progress. At first, the low-acid material had only a limited market in special plastics, but as it became

* Several formaldehyde producers also use a cation exchanger—to remove traces of iron before the acid is removed.

freely available, the market grew until now most formaldehyde manufacturers have low-acidity formaldehyde available as a standard product.

Glycerine producers, too, have found that ion exchange fits in with their processes, that their product can be upgraded by demineralization. Some grades (e.g., those resulting from pressure hydrolysis) contain initially only a small amount of ash and a little color or organic matter that can be removed in a mixed bed. The glycerine coming from the hydrolyzer can, after cooling, settling and filtration, be treated to remove fatty acids and metallic soaps. Effluent from the demineralizer, evaporated to a high gravity, meets C.P. or reagent-grade specifications. Occasionally, bleaching may be required after the concentration.

This same process can be used on single-distilled or high-gravity glycerine. In this case, the glycerine is diluted with sweet water (demineralized from a previous cycle), demineralized and then brought back up to concentration.

Soap lye crude glycerine is also being demineralized successfully. Since the ash load is high it is generally passed through several cation and anion exchangers in series in order to produce a high-grade product and to utilize the ion exchangers most economically and effectively. In some cases, the final treatment is mixed-bed demineralization.

Where soap lye crude must be upgraded, demineralization competes with distillation. It has been calculated that in a new glycerine plant, with stills not already in operation, demineralization results in lower over-all costs where the ash is below 10% in 82% glycerine. However, where stills are already in and operating, the economics do not favor their replacement by demineralizers. In this connection, it's probable that few new soap lye crude plants will be built. The future of the whole glycerine industry is clouded by the growth of synthetic processes and by the increasing popularity of detergents, with a consequent reduction in soap and by-product glycerine production.

Future installations to make glycerine from fats will probably favor hydrolysis. In such plants, demineralization is economically attractive. The installed value of operating glycerine demineralizers is probably about $200,000. Annual replacement of the ion exchange resins means a market of about $50,000/year.

Other Organics: Industrial organics are not, of course, the only targets of ion exchange men in the field of organics; they're also pointing at applications in fine chemicals, fermentation products including antibiotics:

- A major refiner of corn products has patented a process of making glucoronolactone by the reaction of demineralized dextrose with methanol to form methyl glucoside. That, in the presence of a hydrogen exchanger catalyst and at high temperatures, is converted into the lactone. An anion exchanger then adsorbs the lactone, which is eluted when the bed is exhausted.

The removal of excess sulfuric acid used in the manufacture of many organic compounds can be accomplished easily and economically by adoption of a process employed in β-alanine manufacture. Here the major portion of the sulfuric acid is neutralized with lime or barium. But to assure an easier filtration, the solution is not completely neutralized. A sulfate-free product can be attained by removing the sulfuric acid that remains in an anion exchange unit.

- It's possible to control fermenta-

Ion Exchangers: What They Are, Who Makes Them

Cation Exchangers Type	Tradename	Company
Sulfonated coals	Zeo-Karb	The Permutit Co.
Sulfonated cross-linked polystyrene copolymer resins	Permutit Q	Permutit
	Amberlite IR-120	Rohm & Haas Co.
	Amberlite IR-112	
	Nalcite HCR (Dowex 50)	National Aluminate Corp.*
	Duolite C-20	Chemical Process Co.
Sulfonated phenol-formaldehyde resins	Zeo-Rex	Permutit
	Duolite C-3	Chemical Process
Carboxylic acid resins	Permutit H-70	Permutit
	Amberlite IRC-50	Rohm & Haas
	Duolite CS-101	Chemical Process
Phosphoric acid resins	Permutit XP	Permutit
	Duolite C-61	Chemical Process
Anion Exchangers Type	**Tradename**	**Company**
Weakly basic	De-Acidite	Permutit
	Permutit W	
	Amberlite IR-4B	Rohm & Haas
	Amberlite IR-45	
	Nalcite WBR	National Aluminate
	Duolite A-4	Chemical Process
	Duolite A-6	
Intermediate basicity	Permutit A	Permutit
	Ionac A-300	Permutit
	Duolite A-70	National Process
Strongly basic—quaternary alkyl amine	Permutit S-1	Permutit
	Amberlite IRA-400	Rohm & Haas
	Nalcite SBR	National Aluminate
	Duolite A-40	Chemical Process
Strongly basic—quaternary alkanol amine	Permutit S-2	Permutit
	Amberlite IRA-410	Rohm & Haas
	Nalcite SAR	National Aluminate

*National Aluminate markets the Dowex resins of Dow Chemical

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tion by cation exchange: removal of calcium, magnesium and some of the heavy metals required for growth of organisms from the fermentation medium controls or checks fermentation. No attempt is made to reclaim anything from the regenerant effluent, although such constituents as amino acids or potassium may be present. This process is not being practiced on a large scale in this country yet. In Europe, however, several installations have been successful in upgrading wines. They're usually cation exchange units (regenerated with acids, salts or mixtures) and anion exchangers to remove acids.

Anion exchange is used in a number of fermentation processes to remove an undesirable anion and substitute a more desirable one. In the manufacture of citric acid from molasses by fermentation, one of the last steps (before crystallization) employed by one manufacturer is the removal of sulfuric from the citric acid by anion exchange. After regeneration of the anion exchanger with alkali, pure citric acid is passed through to provide citrate anions that exchange for sulfate ones in the solution.

Amino acids are converted from one salt into another by the use of anion exchangers. The solutions sent through anion exchanger beds, exhausted with the anion to be substituted and are then regenerated with a salt or acid solution containing the anion to be exchanged.

• Ion exchange is employed in several successive steps of manufacturing certain antibiotics. A striking example of this is the separation and purification of antibiotics from the fermentation broth by adsorption on a carboxylic acid resin in the sodium form. This is followed by elution with acid and subsequent conversion of the antibiotic into another salt by anion exchange. Virtually all of the streptomycin now being manufactured is adsorbed from the broth in this manner and several hundred thousand dollars worth of equipment and ion exchange resins are installed in these processes.

Foodstuffs: It is possible to produce a stable powdered cream by treating skim milk with a cation exchanger. But only two or three such plants are now in operation and the quantity of ion exchange material needed to supply them is only a few hundred cubic feet.

Ion exchange has been a subject of much investigation in the refining of sugar. Here's why:

Historically, processes of refining sugar from the three major sources—cane, beet and corn—have included a crystallizing step in which the largest portion of the sugar is obtained as crystals of satisfactory quality. The remainder, however, is lost in the mother liquor, molasses, which also contains all the nonsugar solids and organic matter, along with a considerable quantity of ash.

The calcium salts—initially present and formed through clarification—tend to scale the evaporators, and the alkali metals inhibit the crystallization of the sugar products. Organic constituents increase color and impair flavor and other characteristics of the crystallized sugar.

Ion exchange resins have proved themselves capable of removing these undesirable impurities. Sugar refiners, in fact, have pumped millions of dollars into commercial installations as well as pilot plant work. But of the dozen or so commercial installations made in this country, only half a dozen are now in operation and only a few of those show real profit.

The refiners have found that installing ion exchange equipment is a complex economic problem: while the resins improve the quality of the molasses, they reduce the quantity. If molasses is in surplus or causing a waste disposal problem, this would be desirable. If, on the other hand, it's commanding a steady market (in feeds and as a fermentation raw material), an ion exchange unit would be unattractive.

More important, sugar refiners already have a heavy investment in bone char filters and auxiliary equipment, which they're loth to shelve. And the high replacement costs for resin in such an installation, on top of a high initial outlay for chemicals, make the refiner hesitant about adopting ion exchange.

Development work is continuing on new ion exchangers that will maintain their effectiveness over long periods of time. But even the availability of such stable ion exchangers may not improve the economics sufficiently to make application on cane and beet sugar manufacture attractive except for specialty products because of the frequent small spread between the value of sugar in molasses and in the crystallized form.

This is how ion exchange is used in sugar refining: the sugar solution, after clarification, is first passed through a cation exchanger and then through an anion exchanger. When

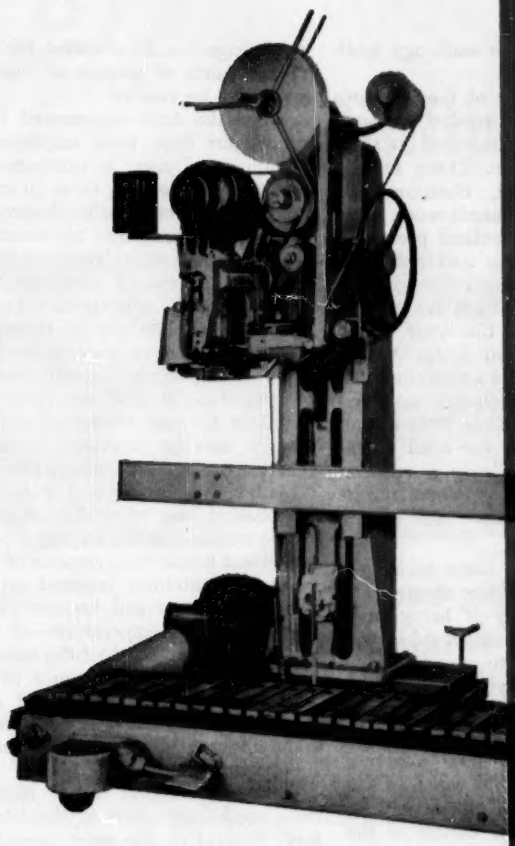
CHEMICAL MARKETS IN ION EXCHANGE

Two markets for chemicals occur in connection with ion exchangers: regenerant chemicals and those needed in the manufacture of the ion exchange resins. Neither has a significant impact on the over-all consumption of chemicals. Conventional regenerant chemicals and a rough estimate of their rates of consumption:

Commodity	Consumption (tons/year)
Salt	200,000
Sulfuric acid	50,000
Soda ash	50,000
Caustic soda	15,000
Hydrochloric acid	5,000

Reports from various sources indicate the type and quantity of chemicals used in the preparation of ion exchange resins:

Commodity	Consumption (lbs./year)
Styrene	5,000,000
Divinylbenzene	500,000
Sulfonating agents	20,000,000
Organic amines	500,000



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the exchangers are new, they remove a considerable portion of the color and organic nonsugars, as well as the ash, but this property decreases with continued use. After exhaustion, the beds are sweetened off to reclaim the residual sugar, and then regenerated. For large plants, sulfuric acid and ammonia or soda ash are the favored regenerants and some thought has been given to reclaiming the regenerant effluent of ammonia regeneration as a fertilizer solution. Work has been conducted on recovering amino acids and organic acids from some of these regenerant solutions.

Sulfonated cation exchangers tend to cause catalytic inversion of the sucrose, and in those cases where this invert sugar is objectionable, reverse demineralization may be used. This consists of strong base anion exchanger treatment, then carboxylic acid-type resin cation exchange. However, this process results in incomplete demineralization and may cause destruction of sugar by the highly basic anion exchanger.

The two-step demineralizing process has been applied commercially to liquid sugar manufacture from raw cane sugar and to manufacture of dextrose and glucose from corn and milo maize. Customarily, anion exchangers of intermediate basicity are preferred to remove both strong and weak acids. In liquid sugar manufacture, the scale of operations is generally too small to warrant the huge investment in standard bone char refining equipment. Demineralization and decolorization by activated carbon treatment or chemically regenerated decolorizing resins yield a good product. The water introduced during processing does not have to be evaporated off completely. Thus, demineralization has been found more useful for liquid sugar than for granular sugar manufacture. In starch conversions, besides improving quality and reducing the amount of hydrol or molasses formed, demineralization is desirable because it reduces the crystallization time for dextrose and thereby the plant investment. In glucose manufacture low ash and color are the achieved aims of ion exchange treatment.

Medicinals: Many of the functions of the human body involve the same phenomena as are observed in studies of ion exchange. These include ion exchange itself, chelation and diffusion through membranes. Biochemists and the medical profession have recognized this and are energetically studying ion exchange substances. Several products are already being marketed for the relief of ailments of the human body. Among these are a mixture of ammonium and potassium cation exchange resin ingested to remove sodium from the intestinal tract. Thus, the level of sodium in the entire body is reduced in the management of edema resulting from cardiac failure and kidney malfunctions.

Another resin, an anion exchanger to absorb acids in the stomach in peptic ulcer therapy is being marketed. An inorganic cation exchanger is used in geriatrics to absorb certain poisons from the system and it is claimed to bring about a general improvement in health for older people.

Medicinal markets now consume approximately $100,000 worth of ion exchangers annually. Should it be possible to reduce the dosage of the sodium removal resin in order to overcome its objectionable bulkiness, a market of several millions of dollars for this one preparation alone might result.

Other new medical uses still in the laboratory stage may have an equally bright future. One of these is a cation exchanger with adsorbed quininium, which is used as a diagnostic tool in determinations of free acid production in the stomach.

An intriguing application of ion exchange to blood processing has been developed in connection with blood stockpiling. Within a short time after blood has been withdrawn from a donor, the calcium causes it to clot and become useless for transfusions unless sodium citrate or some other agent is added to complex or chelate the calcium ions. Under the auspices of the American Red Cross, workers at Harvard University developed a special ion exchange unit for the treatment of blood. This is a cartridge placed directly in the line through which the blood is drawn. A special sterile and nonpyrogen-bearing cation exchange resin of the sulfonated, cross-linked polystyrene type in the sodium cycle is used. Substitution of sodium for the calcium renders the blood stable for many days. This application is still only in the development stage but, if successful, hundreds of thousands of pounds of resin per year may be needed.

Catalysis: Acid regenerated cation exchangers have been employed for a number of years as catalysts on a laboratory scale and, to some extent, on a commercial scale. Among the catalytic reactions that are conducted by employing this "solid acid" are esterification, ester interchange, ester hydrolysis, aldol condensation and de-esterification. The use of these substances as catalysts permits reactions of many chemicals that are sensitive to conventional acid catalysts. The reactions are easy to control and the catalyst can be separated from the reaction mixture by a simple filtration.

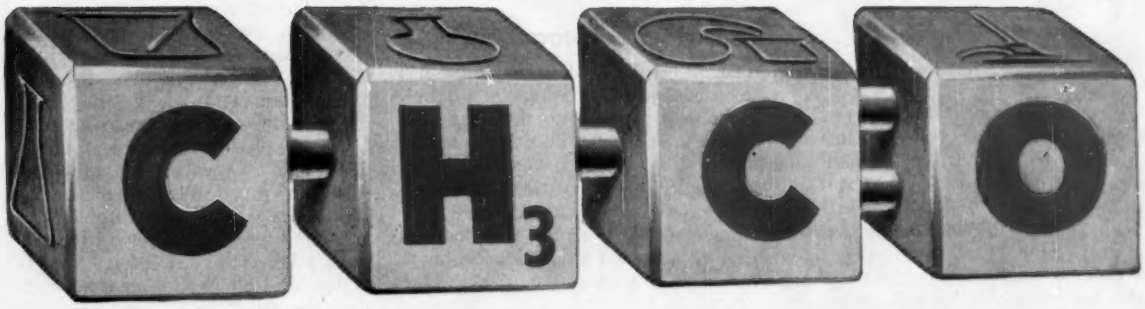
Although catalysis is a potentially big market, use of acid regenerated cation exchangers has not yet reached significant proportions because of temperature limitations imposed on the cation exchanger and because of the loss—at high temperatures—of the water needed to conduct the catalysis and to facilitate performance of the ion exchanger. The sulfonated coal-type cation exchanger is effective, in some instances, in spite of the absence of water.

Anion exchangers have likewise been used as catalysts in the laboratory. Several of the more successful applications have been aldol condensations, cyanomethylation of alcohols and the reaction of aldehydes with aceto acetate (the Knoevenagel Reaction).

Chromatography: Ion exchangers may be used to separate mixtures of similar ionic substances by three distinct methods:

- One means of separation depends on the ability of ions that are strongly held to displace those less strongly held. Sharp separation is generally not possible, but there is an enrichment of least strongly held components in the effluent, while the ion exchanger bed contains the enriched strongly held components.
- By proper selection of ion exchangers for active groups or for porosity, it is sometimes possible to obtain sharp separation of components. Acting as molecular sieves (*CW, No. 20, p. 64*), ion exchange materials can separate amino acids and certain components of gas mixtures.
- In addition, complexing agents may be used so that a particular component in the mixture is not adsorbed. Or, a small amount of a mixture of similar ions may be adsorbed in an ion exchange bed and then separated by elution with complexing agents that accentuate the small differences

simple as



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in affinity. Perhaps the most striking example of the latter method of separation is the work done at Oak Ridge National Laboratory and at Iowa State College in the separation of rare earths.

Certain nonionic constituents may also be separated by ion exchange: A column is exhausted with an ion capable of forming ionized complexes with the nonionic constituents to be separated. Then, when the nonionic constituents are passed through, complexing takes place and the mixture is separated on the basis of differences in stability of the complexes. Borate complexes of sugars, for instance, are separated in this manner; the borate acts as the complexing ion.

Ion exchange chromatography, as a new tool, has attracted widespread interest in many fields including inorganic chemistry, amino acids, nucleotides and sugars. Biochemists and organic chemists are finding these methods valuable in conducting difficult separations. Undoubtedly, industrial applications of some of these methods will soon be realized.

The New Approaches

The principle of ion exchange has been recognized for over a hundred years. But for most of that time, the theory lay dormant, awaiting practical applications. It was not until approximately 18 years ago—when the original ion exchange materials were supplemented by organics—that ion exchange achieved general acceptance for any purpose other than water treatment.

But though it got off to a slow start, ion exchange applications are now moving along at a rapid pace. To the conventional ion exchange columns, for instance, have been added, in recent years, ion exchange membranes. Another new process, ion exclusion has also been introduced. And there's been a considerable amount of development work to make ion exchange a continuous process—although ion exchange still must be classified as a batch operation.

Exchange by Membranes: Electrodialysis involving ion exchange membranes is currently undergoing intensive study in many laboratories. The motivating factor behind its development is this:

One of the principal drawbacks to ion exchange for some applications is the fact that when used to remove ions in a concentrated solution, the resins become exhausted rapidly. Costs of regenerating them becomes a significant factor.

In electrodialysis, the electricity takes the place of regenerant chemicals, thus can widen the scope of economic practicality when dealing with a heavy concentration of ions.

A good way to understand the difference between conventional ion exchange and electrodialysis is to visualize the structure of a typical resin bead as a rag ball made from a fish net. Numerous acidic or basic groups are permanently attached to the strands of the netting.

Ion exchange membranes have the same internal structure as beads except that instead of a ball, the netting is in the form of a continuous sheet. The fixed acidic or basic groups for both types of ion exchangers form salts with cations and anions, respectively, and these cations and anions can do two things: they can move

THE THREE APPROACHES TO ION TRANSFER — HOW THEY COMPARE

	ION EXCHANGE	MEMBRANES	ION EXCLUSION
Applications	In general, for solutions of up to several percent in concentration.	In general, for solutions over several percent in concentration.	Separations of ionic substances from nonpolar liquids. Also, separation of weak ionic substances from strong ones.
Advantages	Efficient in very dilute solutions; flexible, simple, thoroughly tested; low-cost equipment.	Low operating cost per mole transferred. Suitable for high concentrations of electrolytes.	Uses conventional equipment; low regenerant cost. Neither total nor relative concentration of constituents is material.
Disadvantages	Occasional high regeneration costs. Requires clear solution, dilutes product.	Chemical instability. Equipment must be developed. Cannot economically produce pure effluent or treat very dilute solutions. Some chemicals may pose electrode difficulties.	Relatively low capacity, hence higher initial cost, dilutes product.
Prospects	Gradual growth, will remain leader.	Bright potential in brackish water treatment and as pretreatment before percolation ion exchange.	Limited applications.

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MANY GRADES—Standard and special grades in melting points from 10° C to 135° C.

Physical and Chemical Properties—Standard Grades

Grade Number	*Melting Point ± 3°C*
S-10	10° C
S-25	25° C
S-40	40° C
S-55	55° C
S-70	70° C
S-85	85° C
S-100	100° C
S-115	115° C
S-125	125° C
S-135	135° C

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COMPOSITION—Composed essentially of polymers of pinenes, predominately beta pinene.
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ALKALI RESISTANCE—Unattacked by 10% solutions of alkalies.
SALT RESISTANCE—Unattacked by salt solutions of varying pH.
HEAT RESISTANCE—When held at 600° F for six hours no darkening in color was observed.
SAPONIFICATION—Saponification number approximately zero.
ACIDITY—A neutral resin, acid number approximately zero.
SPECIFIC GRAVITY—Has low specific gravity, varying with melting point between 0.98 and 1.00.
THERMOPLASTICITY—A readily thermoplastic resin.
MELTING POINTS—Various melting points available from 10° C to 135° C on the Ball and Ring softening point method. (Tolerance, 3° C).
COLOR—A 50% solution in mineral spirits approximately color 5 on Gardner 1933 scale.
SOLUBILITY—Completely soluble in aliphatic hydrocarbons.
ASH—Less than 0.1%.
FORM—Solid.
PACKAGE—Solid grades in light gauge drums; plastic grades in heavy, open-head drums.

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C W Report

rather freely through the network structure, and they can leave the network structure to let a different ion come in. The latter process will be recognized as conventional ion exchange; regeneration is obviously required after the resin is saturated with exchanged ions.

In electrodialysis, however, only the ability of the cation or anion to move through the membrane is important. For example, if a cation exchange membrane separates into two chambers a vessel containing salt water, the sodium ions move freely through the membrane in both directions; the chloride ions cannot pass through the cation membrane and remain in the original chamber. If a small electric field is applied, the sodium ions will move through the membrane only in the direction of the negative electrode. At the end of the process all the sodium is found on one side of the partition, and the equivalent hydrochloric acid on the other side. By suitably constructing a multichambered cell partitioned with cation and anion exchange membranes, a stream of seawater may be continuously divided into a pure water stream and a highly concentrated brine, at the expense of a small amount of electrical energy.

As an example of the economics, desalting of a brackish water of 5000 ppm. electrolytes down to 500 ppm. by conventional ion exchange would cost $1.32/1000 gal. Treating the same water by a membrane cell would cost only $0.15/1000 gal. (This, however, represents only a portion of the total desalting costs.)

Electrodialysis with ion exchange membranes offers promise in fields other than water purification: chlorine-caustic manufacture, the concentration of dilute spent pickling acids, waste salts and alkalies, protein demineralization, and the separation of certain ions all appear to be practical applications. In the electrochemical industry energy losses due to mixing of anolyte and catholyte can be minimized by the use of ion exchange membranes as partitions. It is anticipated that the increased knowledge being obtained in this field and the improved membranes being developed will soon expand the fields of ion exchange application by facilitating treatment of regenerant effluents.

Ion Exclusion: Another new process that depends on the unique cross-linked structure of the bead-type ion exchange resins has been termed "ion exclusion." This process is essentially a solid-liquid extraction, in which the substance sorbed in the solid resin phase is recovered by water elution.

Ion exclusion makes use of one of the properties of ion exchange materials, namely that there is a distribution of any ion or dissolved chemical compound between the resin and the solution with which the resin is in contact. Since there is a highly charged network—either positive or negative—within the resin particle, ions of like charge will be repelled. Thus, when a mixture of a highly ionized and weakly ionized acid is contacted with a cation exchange resin in the hydrogen cycle, itself a strong acid, the weak acid will distribute itself in the resin particle, and the strong acid in the solution. Displacement of the solution from the void space will yield the strong acid in a purified form.

The displacement medium will cause a new distribution of the weak acid back into the liquid phase. The result is production of two purified solutions with no operating chemical cost except for the displacement solution, which is generally water. An extraction carried out with an ion exchange resin on a solution of salt and ethylene glycol in water can thus be used to remove the salt, the only regenerant being the water required to rinse the resin free of ethylene glycol.

In practice, advantage can be taken of the rate of sorption and desorption of the desired constituents, so as to improve on the results that can be obtained from a simple, batchwise equilibrium operation. Both of the solutions will have a slightly lower concentration than the original. Limitations stem chiefly from the low throughput and character of solutes and solvent. A disadvantage is that in the sorption step, the maximum volume to be treated is only a fraction of the resin volume. Only one large-scale unit has been reported in operation—probably for removing salt from ethylene glycol.

Recent improvements in column ion exclusion have been reported in which by appropriate recycling, it is possible not only to purify a nonelectrolyte solution of its salt content, but also to concentrate the nonelectrolyte.

Q. *Could chemical research develop shock-absorbing fluids whose performance would be relatively unaffected by extremes of temperature?*

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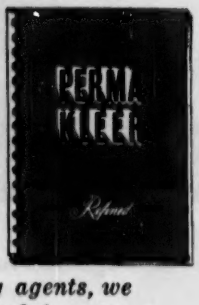

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C W Report

What the Future Holds

It is always dangerous to try to forecast what the future holds in a field developing as fast as that of ion exchange. The last 10 years have seen the introduction of new ion exchange resins that have made possible many new applications both in water treatment and elsewhere. Obviously, improved ion exchangers will continue to be brought out and new types of resins will be introduced. More rugged exchangers will be developed to withstand the increased abrasion encountered in continuous devices. Chelating resins for adsorption of specific ions to the exclusion of others and improved monofunctional cation and anion exchangers to permit more effective separation of ions will be developed.

The benefits of ion exchangers or the ion exchange principle will play a bigger role in medical research and in preparations such as diagnostic tools, skin salves, adsorbents and carriers for drugs to be released at a controlled slow rate.

Ion exchange is becoming a common laboratory tool. Specially prepared ion exchangers perhaps in the form of pellets or capsules may be useful for routine qualitative and quantitative analytical procedures. If past experience is any indication, this increased use in the laboratory will result in a variety of industrial applications. Entire plant processes will evolve from ion exchange developments. The forerunners of these are already appearing in the manufacture of several organic chemicals where catalytic conversion, purification and concentration steps are all utilizing ion exchangers.

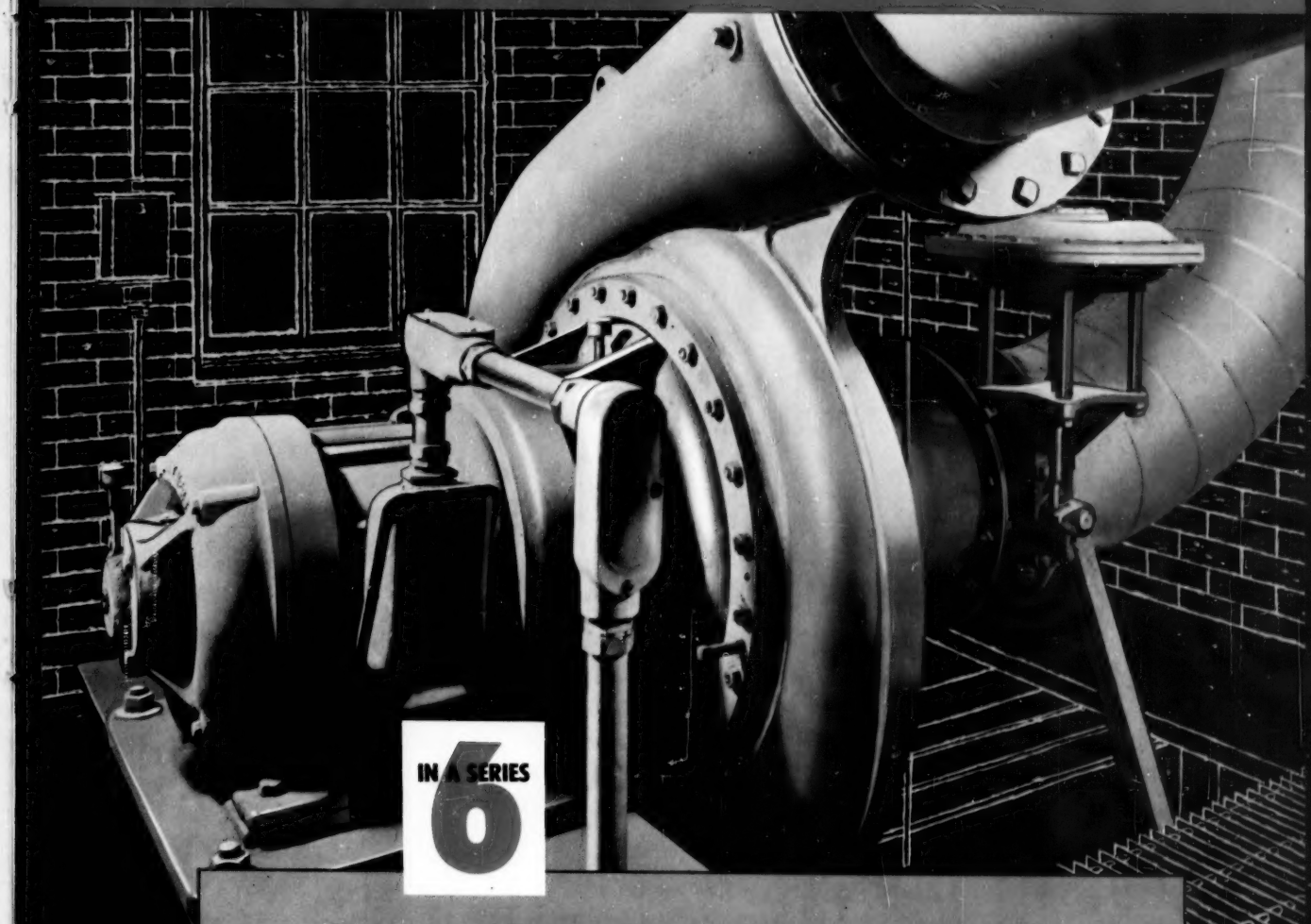
Techniques will be devised to reduce investment and increase yield. Continuous countercurrent processes, equipment and regeneration techniques will be developed to treat both aqueous and nonaqueous solutions. Treatment of slurries will advance from its present pilot plant state to a commonplace operation.

Ion exchange can play a vital role in solving water shortage crises by permitting a greater degree of reuse and recycling. For example, almost no electroplating shop will operate without ion exchange either in water treatment or purification of plating solutions. Already, many of the newer plating shops have adopted such combination processes. These permit recovery of the metals in rinses, improved work, and reuse of the water (which is frequently hot, thereby saving heat values also). The present legal, esthetic and public health pressures for elimination of water pollution will lead to reliance on ion exchange processes to recover a variety of valuable chemicals simultaneously with waste elimination. Closed cycle rinsing, refining, solvent extraction processing or leaching steps that depend upon ion exchange will be in operation. Such ion exchange processes have already been applied to photographic film rinsing operations. Ion exchange will be widely used in hydrometallurgy as one of the new techniques of working up poorer and more complex ores.

New and cheaper chemicals, notably rare earths and transuranium compounds, will be available only because of ion exchange. The preparation and separation of two new elements, californium and berkelium, was greatly aided by the use of ion exchange techniques. Ion exchange will make possible a degree of purity now unattainable, thus open some chemical doors that are presently closed. Low-acidity formaldehyde treated by anion exchange has already been so well accepted that several previously commercially unfeasible plastics owe their existence to it; and some formaldehyde manufacturers are encountering sales resistance to the untreated product that was previously the industry's standard.

The amounts of solution presently treated by ion exchange are so great as to make this process one of the major unit processes in terms of volume handled. It is estimated that the installed water conditioning capacity of ion exchange installations in the U. S. is more than 10,000,000 gpm., or enough conditioned water in a day—if all operated at rated throughput—to fill a tank ¼ mile long by ¼ mile wide to a depth of ¼ mile, and represents the removal by ion exchange of more than 300 carloads of $CaCO_3$ per day. While ion exchange applications outside the field of water conditioning will never reach these proportions, it is inevitable that the unique problems that can be solved by ion exchange will result in increasingly wider application.

ALLIS-CHALMERS EQUIPMENT FOR AIR and GAS Handling in the Chemical Industry

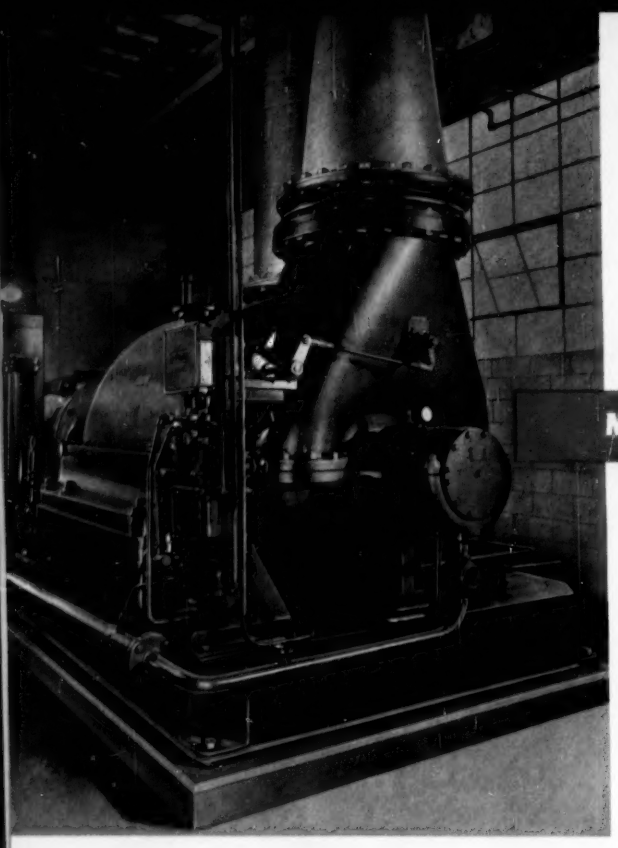


ALLIS-CHALMERS air and gas handling equipment is built in a variety of types and sizes for every chemical industry application. Volumes ranging from 42 to 1,000,000 cubic feet per minute are obtained from Allis-Chalmers single-stage turboblowers, rotary compressors and multi-stage centrifugal and axial machines.

Motor-driven air and gas handling equipment is available as a complete unit — blower, compressor or vacuum pump equipped with motor and control all built by Allis-Chalmers—engineered to work together, backed by undivided responsibility.

A-4511

ALLIS-CHALMERS



ALLIS-CHALMERS single and multi-stage blowers are supplied for either motor or turbine drives with automatic flow or pressure control. Applications include gas boosting and exhausting, agitation, aeration, and circulation. Special casing materials available for handling corrosive gases include cast steel, chrome steel, bronze, 18-8 stainless steel, and carbon-molybdenum steel.

MULTI-STAGE BLOWERS

Centrifugal multi-stage blowers are used singly for volumes from 1000 to 100,000 cfm. Units may be arranged for parallel or series operation as conditions dictate. Horizontally split casing designs are applicable for low and moderate pressures. Vertically split "barrel-type" casings are available for pressure as high as 2500 psig.

Axial multi-stage blowers with 8000 to 1,000,000-cfm inlet volumes provide the same pressure rise obtainable from a single multi-stage centrifugal blower. Because of their high efficiency and small relative size, axial blowers are preferred for large volume operation.

Centrifugal & Axial BLOWERS

Plus

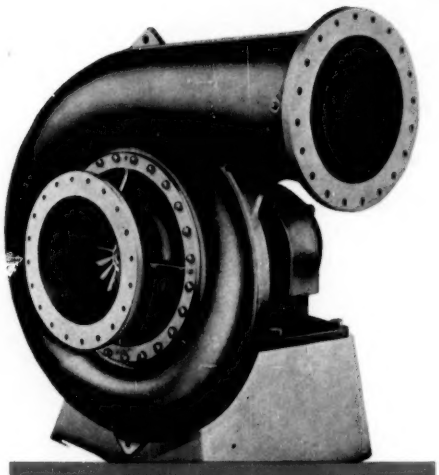
Rotary COMPRESSORS

Allis-Chalmers rotary compressors and vacuum pumps are the sliding vane type. These units consist of a water-jacketed casing with eccentrically supported rotor-fitted blades which move radially in and out of longitudinal slots. In operation, blades are forced out by centrifugal force, forming cells in which air or gas is trapped for compression or evacuation. Thus these units have positive displacement characteristics.

Single-stage rotary compressors are available for 49 to 3245 cfm with pressures of 5 to 50 psig. Two-stage compressor units are built for 387 to 1807 cfm, from 60 to 125 psig.

Single-stage vacuum pumps are applicable for 22 to 5950 cfm at vacuums from 0 to 20 inches Hg. Two-stage pumps are supplied in various capacities up to 29.9 inches Hg.

With Allis-Chalmers rotary compressors and vacuum pumps, high speed operation makes possible a compact unit . . . minimizes floor space requirements. Rotary motion eliminates vibration, simplifies foundation needs. Smooth air flow cuts piping costs, eliminates need for dampening air receivers. Units are self-contained, suitable for direct connection to electric motors or internal combustion engines.



SINGLE-STAGE BLOWERS

Allis-Chalmers single-stage centrifugal blowers are built in pedestal mounting and overhung types for discharge pressures up to 7 psig. Close-coupled design and high speed rotary operation make possible a compact unit — a unit that can be mounted in very little space on a light foundation. Blower construction is simple. The only moving part is the impeller (radial or backward flow).

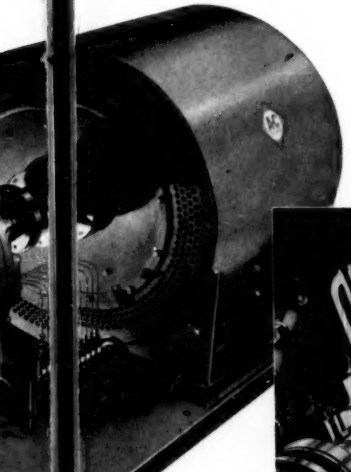
MOTORS

Allis-Chalmers builds a complete line of squirrel-cage, wound-rotor, synchronous, and direct-current motors, with electrical and mechanical modifications to meet any application.

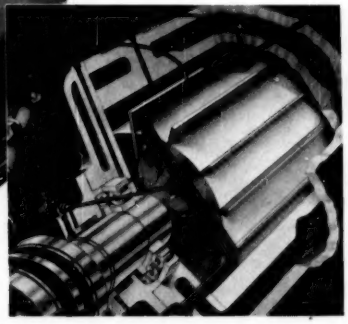
The Allis-Chalmers fin-type, totally-enclosed, fan-cooled motor has a corrosion-resistant cast-iron frame. Rib-type design provides ample reserve cooling capacity. No inaccessible air passages. Improved bearing design affords maximum protection against foreign matter . . . facilitates in-service lubrication. Available in ½ to 100-hp range.

The standard Allis-Chalmers tube-type, totally-enclosed, fan-cooled motor may be modified for chemical plant application. If desired, this motor is available with cooling tubes, stator end-plates and external fan made of metals resistant to acids or alkalies. Explosion-proof types differ from standard machines only in minor mechanical details. Ratings range from 40 to several thousand horsepower.

...the Required Electrical Equipment

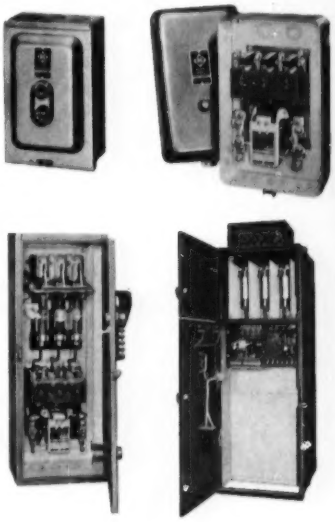


Cutaway view shows sliding-vane construction, water jacketing, and lubrication connections of Allis-Chalmers rotary compressor.



CONTROL

Allis-Chalmers motor controls combine maximum line-to-motor protection with highly efficient operation and low maintenance. The extensive line of full and reduced-voltage starters includes manual and magnetic, reversing or non-reversing, single or multi-speed controllers. Starters as well as pushbutton stations are supplied in general-purpose or special cabinets, such as watertight, dust-tight and explosion-proof enclosures.



ALLIS-CHALMERS

COOPERATIVE ENGINEERING

Your A-C representative is an application specialist — ready and able to work with your staff or your consulting engineers to solve your processing problems. His recommendations are backed by Allis-Chalmers engineering departments . . . by complete research, testing and pilot plant facilities . . . by experience gained in solving thousands of equipment coordination problems. Each processing problem is given personal, expert attention. Engineers and technicians examine and evaluate your process to make *existing* as well as *new* equipment as productive and economical as possible.

UNBIASED RECOMMENDATIONS

Because A-C builds many types and sizes in a given equipment line, recommendations are completely unbiased . . . dictated only by your specific needs.

Most important is the fact that Allis-Chalmers interest in your problem is continuous. Laboratory services, periodic equipment check-up, emergency parts service are yours for the life of the equipment.

Allis-Chalmers builds the following types of integrated equipment:

HEAVY	1	Crushers • Grinding Mills • Screens
LIGHT	2	Flaking Mills • Roller Mills • Screens
PYRO-PROCESSING	3	Furnaces • Kilns • Coolers • Dryers
POWER	4	Generators • Condensers • Pumps • Transformers • Switchgear Substations • Motors • V-Belt Drives • Control
LIQUID HANDLING	5	A complete line of Centrifugal Pumps
R AND GAS HANDLING	6	Centrifugal Blowers • Axial Compressors • Rotary Compressors

Allis-Chalmers also makes equipment for solvent extraction, electronic heating, metal detection, and inter-floor conveying.

A-4511

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A 28-page insert, "Allis-Chalmers Equipment for the Process Industries," may be found in the Chemical Engineering Catalog. This insert is available in bulletin form (25C6177). Individual bulletins covering specific equipment lines also are yours for the asking.

COACH: District Manager Robbins updates Shell salesmen on company policy, diagrams account-handling technique.

Day Behind the Firing Line

At some level in any sales hierarchy, there are men who are directly responsible for definite sales territories. Theirs is the job of supplying the immediate backing for the men on the firing line. They serve by turns as strategist, counselor and consoler of the individual salesmen. Recently, CW followed one such man, noted and recorded while he waded through his, a typical district manager's, day.

James "Jim" Robbins is Shell Chemical's Chicago District Manager. This puts him in key position of one of Shell's largest areas, both geographically and in volume—responsible for sales in the northern half of Illinois, Wisconsin, Minnesota, Iowa, North and South Dakotas, Indiana and most of Kentucky. Stocky, ruddy, robust (215 lbs., 6 ft. 2 in.) Jim Robbins has spent his last 17 or 18 years in chemicals in the Midwest. He has the distinction of being Shell's only district manager (out of 11) without technical training.

Married and the father of two, 40-year-old Robbins started with Shell in 1946, the year the company set up its present marketing organization. Five years later he was promoted to manager of the St. Louis district; last year in August he was transferred to his present post in Chicago.

Robbins has no cut-and-dried schedule. But as head of the Chicago sales team, his position requires him to carry out certain lines of responsibility with some degree of regularity.

The day CW spent with him went like this:

First Off: Robbins checks with his office on the previous day's orders, unshipped orders, total sales for the month to date, various delivery questions.

9:30 a.m. He calls a conference of those of his seven-man force that are in. Discussion revolves around policy, competitors' activity, status of new products and applications.

Suggestions on handling specific accounts, whom to see, what to tell them, are all part of Robbins' contributions to the sales huddle. Having known many of his customers for years, he feels his advice can often smooth his men's way.

11:30 a.m. Conference over, morning mail attended, paper work readied for an afternoon away, Robbins invites American-Marietta's purchasing agent,

CONTACT: Business luncheon, as with American-Marietta's Purcell, is daily fare.

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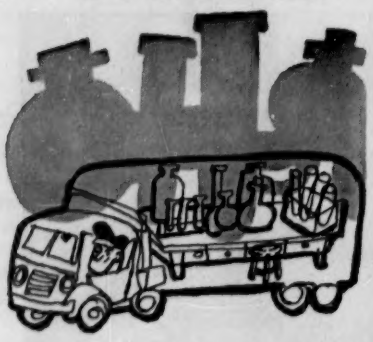

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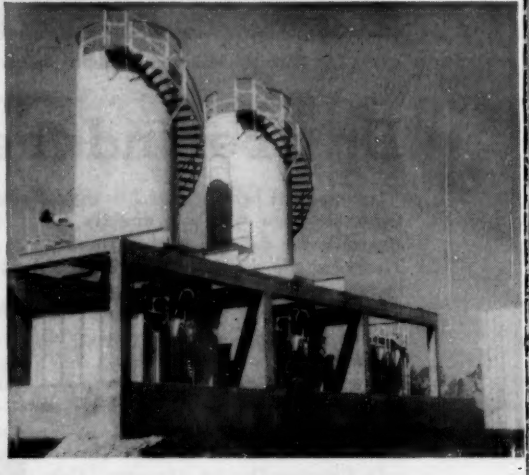
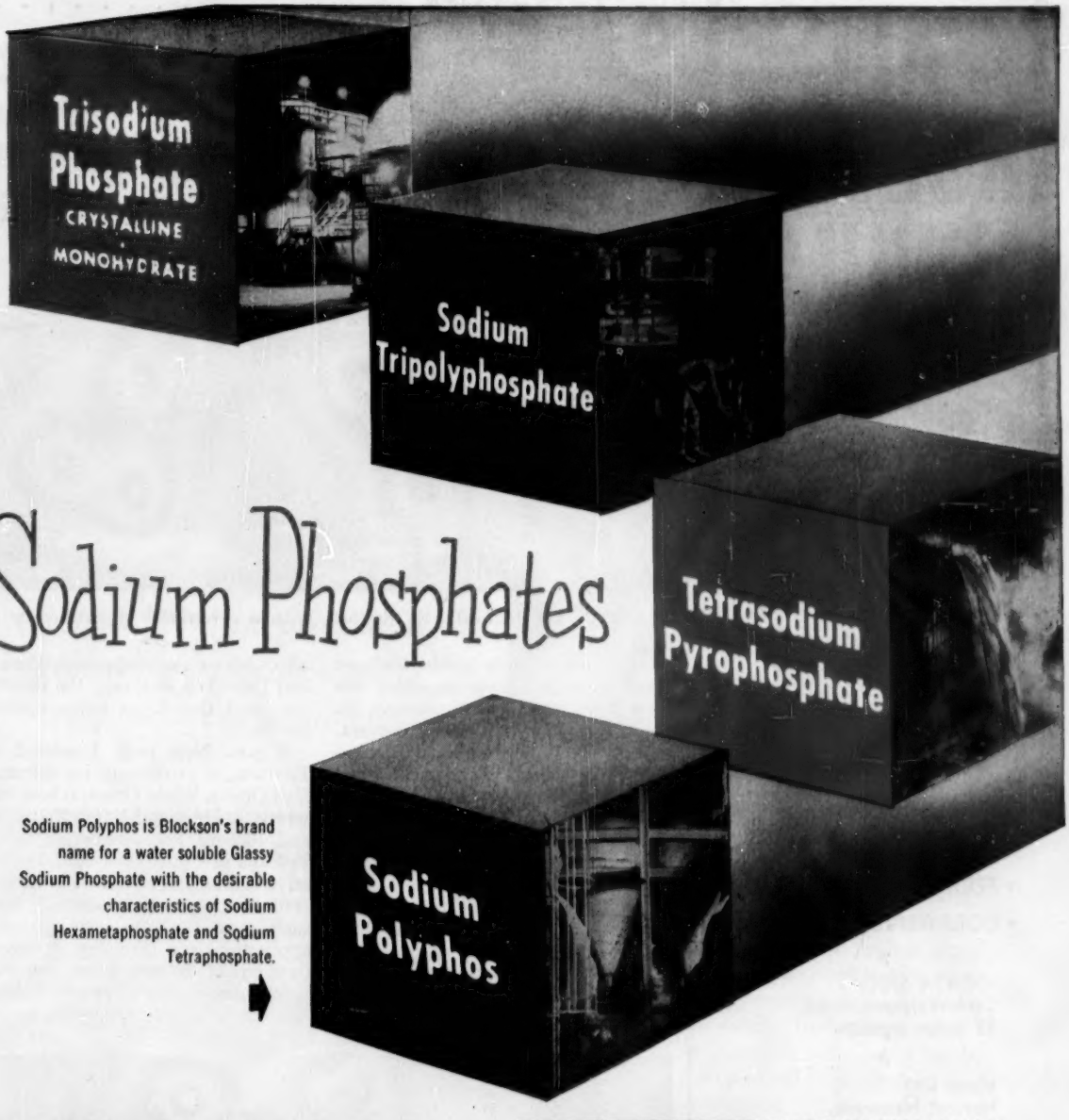
Story begins on p. 61

ROUTINE VISIT (above and right): With Great Lakes Solvents' Dehmlow, Robbins checks Shell stocks, barge and car movements.



CUSTOMER CALL: He discusses service with Universal Oil Products' Ted Wirth (c.) and Richard Schoenenberger.



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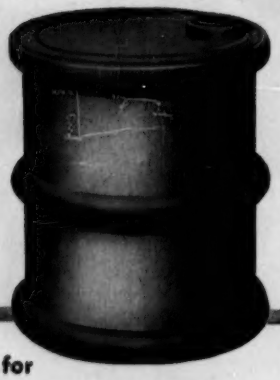

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Story begins on p. 61

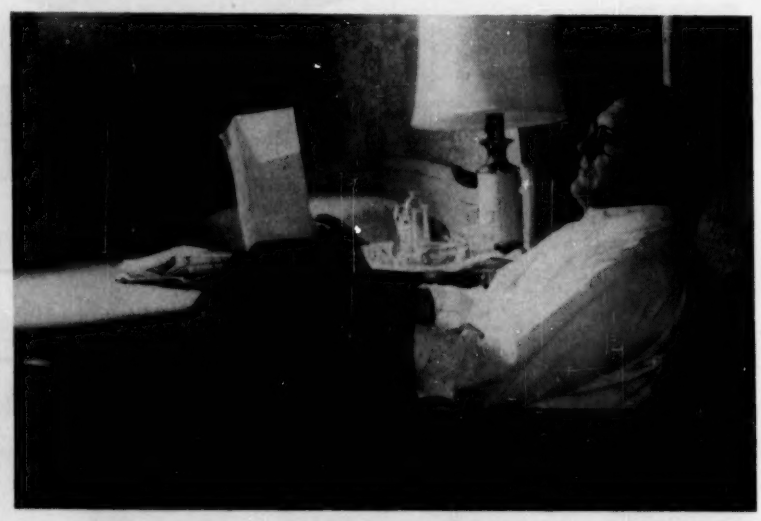
PLANING: 'On the road' half the time, Robbins covers 75% of distance by air.

Ken Purcell, to early lunch. Business luncheon is an almost invariable rite with Robbins, and he encourages his men to do likewise. Table conversation usually centers on business, company policies and services, this day includes preliminary estimates of 1955 contracts.

1 p.m. After lunch, he drives out to Shell's Argo terminal, where he meets Louis Dehmlow, president of Great Lakes Solvents, Inc. First, Robbins makes one of his periodic checks with the terminal manager. Purpose: to ascertain how inventories and barge schedules at Argo (which serves in a 300-mile radius from Chicago) might affect his own commitments. Then he and Dehmlow look over the denaturing plant that Great Lakes operates for Shell.

2 p.m. Next stop, Universal Oil Products, is made with his salesman, Earl Ottens. While Ottens is busy elsewhere, Robbins and UOP's Ted Wirth and Richard Schoenenberger take a look at a new pilot plant unit. Robbins often accompanies his men, as he says, "but to assist, not to check." Stops such as at UOP, to review product applications and company service, he considers of the utmost importance.

3:20 p.m. A quick run puts Robbins aboard plane for Minneapolis. Target:



PLANNING: Contracts-conning, sales strategy-studying wind up Robbins' day.

DOW

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Please send me further information on the uses of Dowicide preservatives.

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*The Journal of Pharmacology and Experimental Therapeutics—Vol. 104, No. 2, Feb. 1952.

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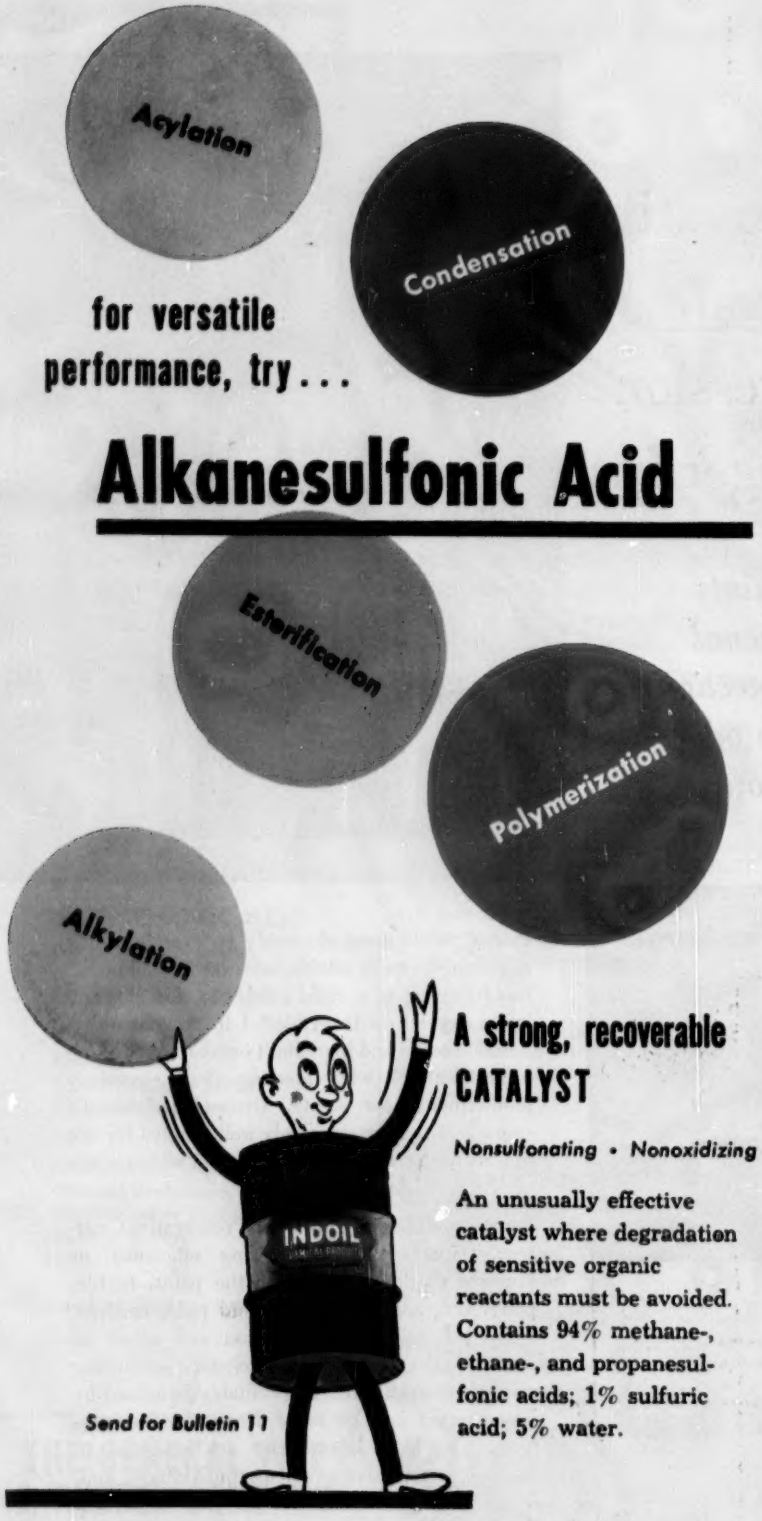
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An unusually effective catalyst where degradation of sensitive organic reactants must be avoided. Contains 94% methane-, ethane-, and propanesulfonic acids; 1% sulfuric acid; 5% water.
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INDOIL CHEMICAL COMPANY
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DISTRIBUTION. . . .

to assist salesman in contract negotiation. Plane travel is virtually indispensible, Robbins feels, in order to do an adequate job of covering his territory. He travels about 100,000 miles/year by air. In addition, he covers 40-60,000 miles by car—about 20,000 in his own, the remainder as passenger in his men's cars. Robbins is on the move about 50% of the time, rather more than the average of 25% to 33% of Shell's district managers. Big reason: the Chicago district contains an unusually large number of medium-size accounts.

When not called away on special trips, Robbins makes a point of showing up at technical association meetings. He's a confirmed joiner—belongs to various drug and chemical; paint, varnish and lacquer; perfume and cosmetic associations, plus Chicago, Louisville and Minneapolis paint clubs. He values these memberships highly, finds them invaluable for contacts, convenient (because they're occasions to see many persons at once) for shortening his already lengthy travels.

10:35 p.m. Regular work day over, Robbins settles back for an hour or so of planning ahead. With new contract details to be checked before submitting and the next day's sales strategy to be mapped, Shell's Chicago manager prepares for tomorrow's run.

•

Plant Hunger: Published jointly by the National Fertilizer Assn. and the American Society for Horticultural Science, *"The Care and Feeding of Garden Plants"* shows the home gardener how to recognize and correct plant malnutrition. The 14 contributing authorities who wrote the book place emphasis on the importance of feeding flora.

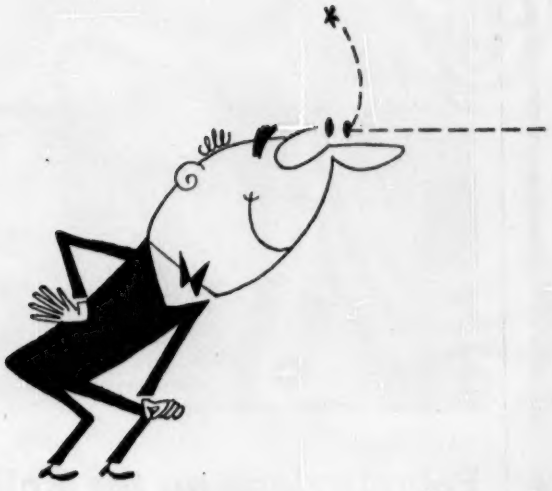
•

Plastics Movie: Reichhold Chemicals, Inc. is now offering for public exhibition the color film, "A New World of Chemistry." The picture presents many of the manufacturing steps involved in production of plastics and plastic products. Designed for lay audiences, the 27-minute film carries no advertising, is available for TV stations, schools, and other groups.

•

Distributor Appointments: Imperial Paper and Color Corp. (Glens Falls, N.Y.) has appointed Polymer Industries Inc. (Springdale, Conn.) and Polymer Southern Inc. (Greenville, S.C.) to sell its textile printing, dyeing, and finishing materials.

• The American Metal Co., Ltd., has been designated sales agents for Tsumeb Corp., Ltd.'s germanium dioxide.



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SPECIALIZED Application Engineering is one of the most important extra values you get in Honeywell instrumentation. Although it's unseen, it's a vital part of your measuring and controlling equipment . . . for it's what assures you of getting most effective utilization of the instrument performance that you buy.

Here's how this service works for you. First, a Honeywell field man sits down with your engineers, production men and instrument technicians. He digs out the facts about your process . . . finds out what needs to be measured or controlled, to what accuracy, under what conditions.

Then Honeywell's Application Engineering staff gets the problem. This group includes men who have first-hand experience in the instrumentation technology of a particular industry. Some specialize in chemical processing . . . others in metal-working . . . others in petroleum. Together they add up to an unequalled storehouse of knowledge on how to use modern instrumentation in modern production. They engineer your complete system . . . including not only the selection of instruments, primary elements and controls, but also the accessory switches, signals and interlocks that add distinctive features of convenience and safety.

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Each year, more than $200 million is spent for solvents used in manufacturing finished products. The figure is increasing. With the advances in various materials for old and new products, solvents are necessary items to a great majority of industries.

Stauffer has been supplying the key industries using solvents since the company's inception. The present addition of a new Perchlorethylene plant in Louisville, Ky., where this important solvent is now being produced by an improved process, is a guarantee of increased supplies. With Stauffer solvents . . . Carbon Tetrachloride, Perchlorethylene, Carbon Disulphide . . . as your assistant, you will find that your processes will become efficient and economical. Stauffer service is designed to suit you!

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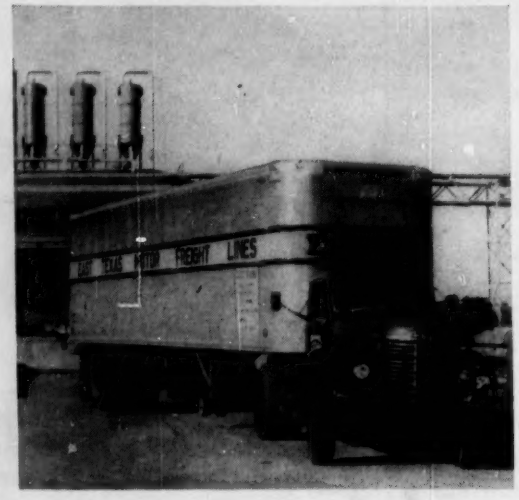


INITIAL SHIPMENT: The first cargo of polyethylene from Texas Eastman's Longview plant departs for the company's customers. Part of the plant is visible in the background.

Polyethylene on the Roll

Rolling away from the loading dock, this big tractor trailer is chock-full of polyethylene pellets. It carries the first shipment of "squeeze" plastic from Texas Eastman's new polyethylene production facilities at Longview, Tex.

The plastic pellets don't need a truck to roll, however. Instead of having conventional cubical or granular form, these pellets are spherical. According to representatives of Eastman Chemical Products, Inc., its distributor, the spheroid shape offers these advantages:

- More uniform flow from the hopper to the heating elements of the molder or extruder. Spherical shape reduces the likelihood of bridging over (locking together) and interfering with the addition.
- Resistance to contamination. The round surface minimizes dust-catching and foreign particle accumulation.
- Lower bulk. Estimated to have a 10% lower bulk factor, the "balls" need less storage space.
- Reduced fines content. Hopper cleaning is facilitated by the fewer fines from the spheroids.

Eastman Chemical plans to ship carload lots directly from the Texas plant, less-than-carload-lots from Kingsport, Tenn. The plant has an annual polyethylene capacity of 20 million lbs. Its output will be offered in various colors and color concentrates.

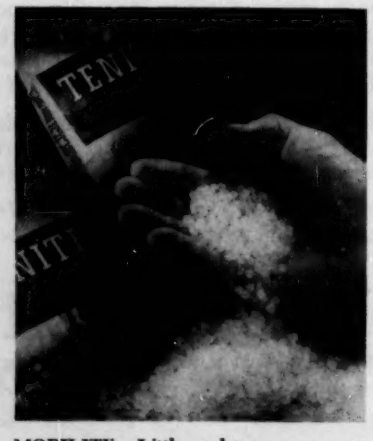
•

New Solvents: Dow Chemical is now offering two new glycol ether solvents and intermediates in tank-car quantities. The two: Dowanol 8 (ethylene glycol ethyl ether) and Dowanol 17 (diethylene glycol ethyl ether).

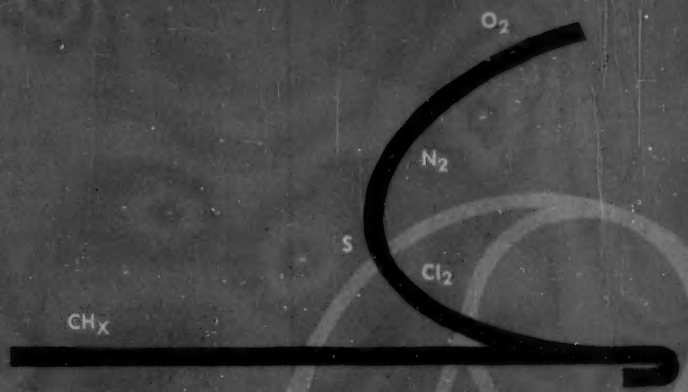
•

Ready for Reference: Ion exchange application to plating plant problems is the subject of a new technical brochure. Treatment methods, plating room use, relative merits of batch and continuous absorption, and economic considerations are discussed. Reprint T-123. Graver Water Conditioning Co., New York City.

- Drum rings—catalog delineating bolted plain lug, weld nut, overlapping, plain lever, lever bolt, and other rings. Drum Parts, Inc., Cleveland.
- Maleic anhydride — technical booklet containing specifications, physical constants, packaging and handling data, and information on its use for various applications. Monsanto Chemical Co., St. Louis.
- Revertex concentrated rubber latex—bulletin providing data on latex



MOBILITY: Little spheres may ease hopper handling, resist soiling.



petrochemical processes

phenol
methanol
maleic and phthalic anhydride
ethylene oxide glycol ethanolamines
ammonia nitric acid ammonium nitrate urea

Foster Wheeler has been actively associated with both the petroleum and chemical industries for over 30 years and has designed and constructed many individual petrochemical process units as well as complete chemical plants.

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products, uses and properties. H. L. Blachford, Inc., Newark, N.J.

- Dry ice loading calculator—device enabling user to figure quantities of dry ice needed to preserve perishables in trailer shipment. R. F. Allyne, The Liquid Carbonic Corp., Chicago.
- Synthetic fiber dyeing—booklet analyzing methods and materials used in synthetic fiber dyeing. Acetate, Acrilan, Celcos, Dacron, dynel, Fortisan, nylon, Orlon, saran, Vicara, acrylic, and blends of these fibers with natural products are considered. General Dyestuff Co., New York City.
- Epoxy resin reference folder—colorful folder for storing reference material. Marblette Corp., Long Island City, N.Y.
- Register of British Manufacturers (1955)—latest edition including new French, German and Spanish glossaries, a buyer's guide listing 6800 firms under 5000 trade headings, an alphabetical directory, and trade association and trademark information. Sponsor: Federation of British Industries. Publisher: Iliffe & Sons, Ltd., London, England.
- Trade Practice Rules for the Chemical Soil Conditioner Industry—Promulgated Oct. 15, 1954. Federal Trade Commission, Washington 25, D.C. Free.
- Information summaries supplying facts on manufacturing, shipments and inventories for various commodities. Of particular interest to the chemical industry: aluminum and magnesium mill products; animal glue; asphalt and tar roofing and siding products; fats and oils; gelatin; paint, varnish and lacquer; refractories; superphosphate; and wood, pulp and paperboard. Bureau of Census, Washington 25, D.C. All 10¢ each (except Fats and Oils, 35¢.)
- Chemical Control Equipment Catalog—also describes equipment available for soil and blood testing. LaMotte Chemical Products, Baltimore.
- Cyanide Waste Disposal—technical booklet furnishing detailed information on chlorine and hypochlorite oxidation of cyanide solutions to nontoxic products. Columbia-Southern Chemical Corp., Pittsburgh, Pa.

•

U.K. Synthetic Rubber Imports: The United Kingdom's Board of Trade is now considering applications to import synthetic rubber from dollar-area countries for six months, ending June 30, '55. Detailed information on the use the rubber will be put to and separate applications for each type of synthetic rubber are required.

CONVERT THESE FACTS TO PROFITS!

ETHYLENE

AND ITS MAJOR DERIVATIVES

IN THIS FACTUAL ANALYSIS of Oklahoma's petrochemical possibilities, the Chemical Plants Division of the Blaw-Knox Company presents finite facts to be converted to the profit potentials of Ethylene manufacture in Oklahoma.

This report takes you from basic Ethylene raw materials to its major derivatives and includes technical and economic considerations in the manufacture and marketing of these products. The sources of raw materials and utilities are presented and the available processes described.

. . . in Oklahoma!

Realizing that the **CHEMICAL INDUSTRIAL EXECUTIVE** is primarily interested in facts, the Oklahoma Planning and Resources Board employed the Blaw-Knox Company to make this factual survey, presenting accurate information on the production potentials of Ethylene and its major derivatives in Oklahoma.

VAST PETROCHEMICAL RAW MATERIAL RESERVES
. . . *Available in Oklahoma!*

Crude Oil Reserves	nearly **2 Billion** barrels
Natural Gas Reserves	over **12 Trillion** cubic feet
Natural Gas Liquid Reserves	**300 Million** barrels
Liquid Hydrocarbon Reserves	over **2 Billion** barrels
Underground Coal Reserves	**55 Billion** tons

Water, too . . . large quantities of industrial water are available at numerous locations in Oklahoma. Reservoirs and surface water in the east . . . wells and underground supplies in the west.

OKLAHOMA OFFERS A HEALTHY INDUSTRIAL CLIMATE IN ONE OF THE NATION'S FASTEST GROWING MARKET AREAS!

Oklahoma's complete Ethylene picture contained in . . .
7 sections
27 tables
8 maps and charts
135 PAGES OF FACTS!

ANNUAL INCOME	$53 *Billion*
RETAIL SALES	$39 *Billion*
BANK DEPOSITS	$37 *Billion*

. . . all within a 500-mile radius of Central Oklahoma.

Write to Czar Langston, Director
OKLAHOMA PLANNING & RESOURCES BOARD
State Capitol Bldg. Oklahoma City, Okla.

Executives of the Petrochemical Industry are invited to write to the Oklahoma Planning and Resources Board for the ETHYLENE REPORT, at no obligation. Also available for general information is the free brochure, "Oklahoma . . . State of Industry."

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If you want technical aid, put Du Pont's experience in the field of aerosol propellents to work for you. Laboratory assistance is available to help you choose the Du Pont "Freon"* propellent that will suit your product best. And we can also advise you on the steps involved in getting your product on the aerosol market. If you are interested in aerosol packaging, be sure to take advantage of these Du Pont services.

The propellent for your product should be one of the "Freon" fluorinated hydrocarbon propellents . . . after all, the vast majority of aerosols sold *are* pressurized with "Freon" propellents. Manufacturers know that "Freon" propellents are ideal for all types of products, and that they are safe . . . nonflammable, nonexplosive, virtually nontoxic. They rely on Du Pont's 23 years' experience with "Freon"—experience that has made "Freon" propellents *the quality standard of the aerosol industry!*

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Answers to the following questions—and many others—are vital to marketers who want to enter the booming and profitable aerosol field. Do you know them?

Q. What types of dealers sell household aerosols . . . personal-product aerosols . . . both?

Q. What per cent of each type dealer's sales is represented by what aerosol products?

Q. Where in their stores do dealers keep aerosol products?

Q. What manufacturers' display material do dealers receive and use?

Q. Why do dealers like to sell aerosols?

You'll find the answers in the Digest of the 7th Annual Aerosol Market Survey made for Du Pont. Mail the coupon below for your free copy today!

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SAFE PROPELLENTS

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Firm_____

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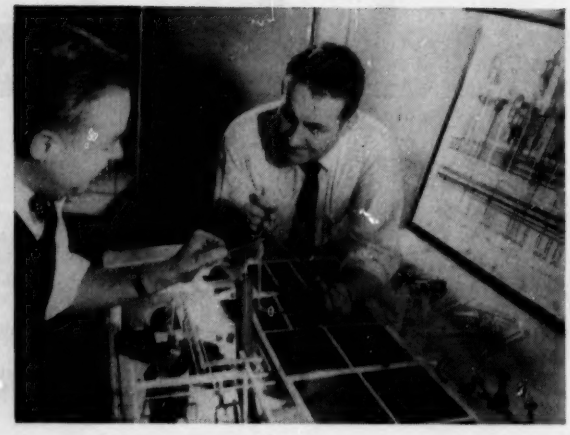


MODEL takes shape as engineers—working only from flow sheets and plot plan—assemble it from prefabricated forms.

COMPLETED just 128 hours later, model is approved by management* (left). Then picture of model is made against a grid background and dimensions are transferred directly onto photo (right). For closeup of finished product, turn the page.

Case of the Photogenic Scale Models

Caught between the growing complexities of chemical process plants on one hand and the demand for lower engineering costs on the other, today's design engineer is relying more and more on improved scale-model techniques. This week, the Parco Co. (New York City) is giving them a new tool to work with: a method of photographing the model, then using the photo itself as the basis for key plans (instead of blueprints) and as an aid in preparing isometrics.

Actually, Parco's system is an intricate one covered by a series of some 18 patents. Designed primarily to facilitate the construction and utilization of scale models, it features preformed components and magnetically mounted equipment that can be shifted from place to place before being permanently fastened. Finally, the finished model can be photographed and the dimensions, along with other necessary information, can be placed right on the picture, thereby eliminating the need for blueprints.

The idea of using models to substitute for blueprints does not, of course, originate with Parco. Industrial Models, Inc. (Wilmington, Del), a pioneer in the model field, has been doing just that for some time (*CW, July 11, '53, p. 46*). And Jeff Bowen, president of the firm, admits he has been investigating the practicality of utilizing photographs of them as the basis for engineering drawings.

Bowen, however, sees some limitations to the photographic techniques. He points out that the equipment areas in some models are congested, that getting usable pictures would be difficult. Also, in taking pictures of models that cover relatively large areas, parallax would cause distortion. Although he doesn't rule out the idea altogether, he feels that some kinks must be straightened out before the method can be made more generally applicable.

Parco's Parker, on the other hand, figures that by using models that can be easily disassembled into sections, congested areas could be photographed. And he feels that the distortion problem can be overcome by taking pictures of individual portions,

* Parco President Jack Parker *(right)* and his assistant, Nat Weisser.

PROFIT STIMULANT FOR THE SOIL

Turning farm products into profits calls for more than modern farm machinery. Today's production booster that adds a bonus of better quality to almost any crop is anhydrous ammonia. It's the newest member of the Atlantic family of petrochemicals . . . that's why you see a miniature refinery superimposed on the field of growing corn.

This ammonia gas is injected into the soil where it combines readily with moisture, providing low-cost nitrogen for plant growth.

Farmers well know that corn, like most crops, takes great quantities of nitrogen from the soil. Anhydrous ammonia acts as a fountain of youth. It gives the soil plenty of nitrogen for high crop yields at minimum cost per acre. In addition, anhydrous ammonia is used in the manufacture of many dry fertilizers.

Perhaps you're not a farmer. Practically all of us, however, benefit from anhydrous ammonia. It is used in widely different industrial products such as synthetic fibers, plastics and explosives.

Industry of all kinds is constantly finding new and profitable uses for Atlantic petrochemicals. Atlantic engineers will gladly work with your technical staff to help reduce costs, improve quality, increase production or develop new and better products through the use of these chemicals. For information on this service, write to The Atlantic Refining Company, Dept. H-122, Chemical Products Sales, 260 South Broad Street, Philadelphia 1, Pa.

Philadelphia, Providence, Charlotte, Chicago

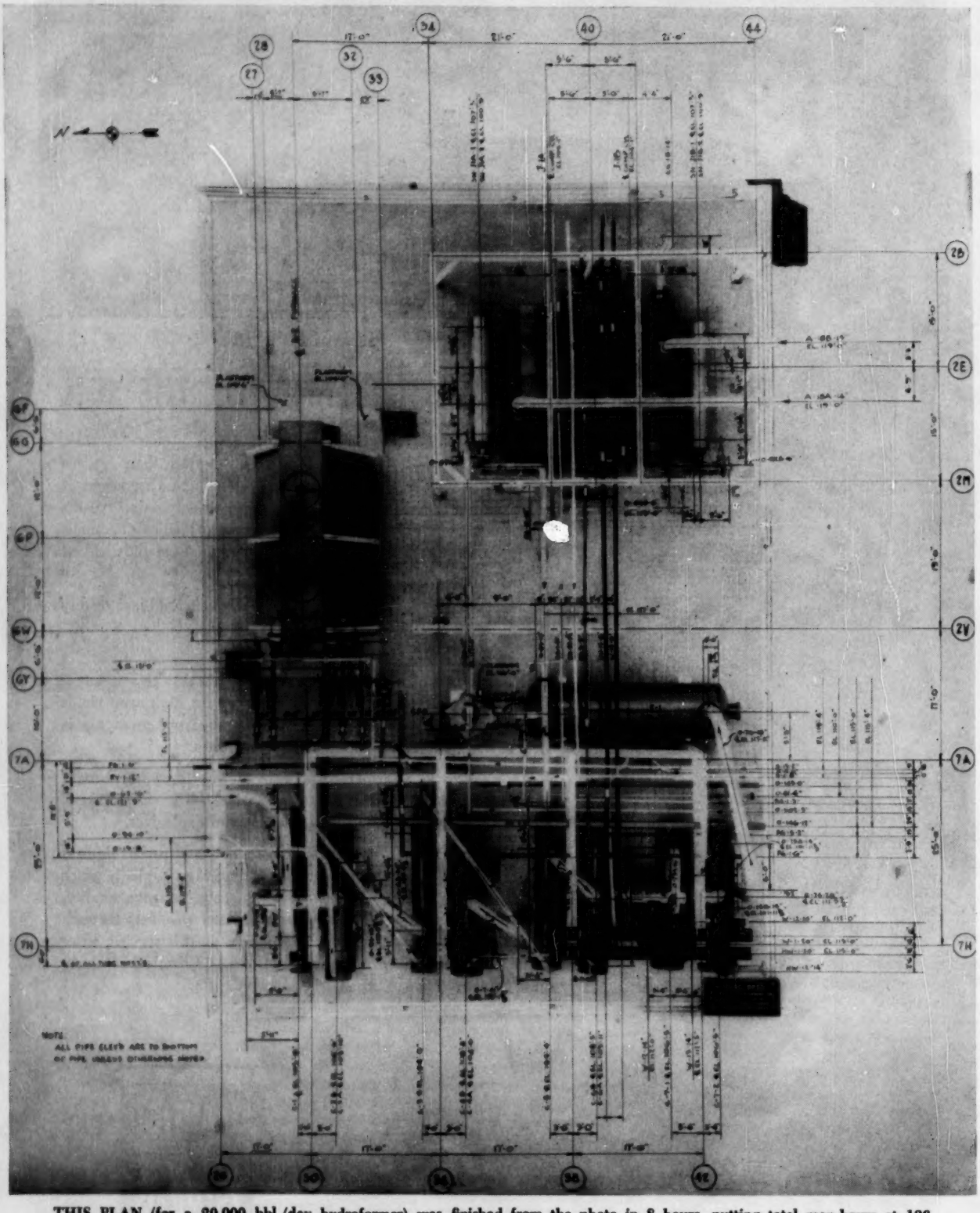
In the West: *L. H. Butcher Co.*

In Canada: *Naugatuck Chemicals Division of Dominion Rubber Company, Ltd.*

In Europe: *Atlantic Chemicals SAB, Antwerp, Belgium*

ATLANTIC
PETROLEUM
CHEMICALS

Story begins on p. 74



THIS PLAN (for a 20,000 bbl./day hydroformer) was finished from the photo in 8 hours, putting total man-hours at 136.

TRITON X-100 Proves Superior in Cleaning Brass and Steel

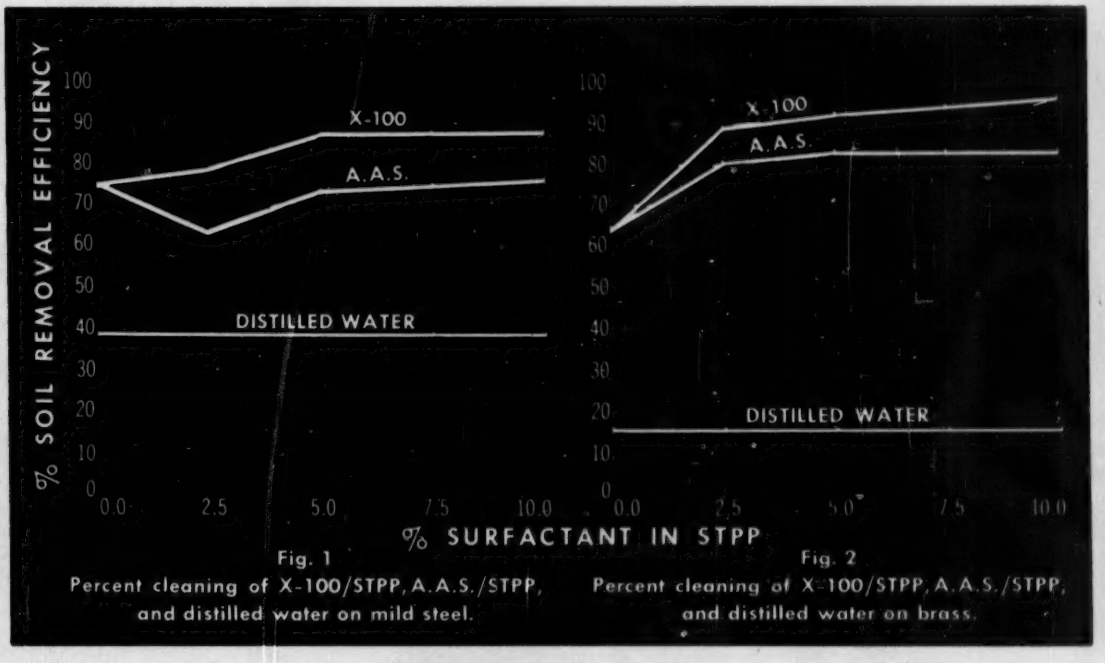


Fig. 1
Percent cleaning of X-100/STPP, A.A.S./STPP, and distilled water on mild steel.

Fig. 2
Percent cleaning of X-100/STPP, A.A.S./STPP, and distilled water on brass.

• In the research laboratories of Rohm & Haas hard surface detergency tests were performed on a number of metals using a large variety of cleaners. Cleaning agents used were TRITON X-100, sodium tripolyphosphate, an alkyl-aryl sulfonate, and, for comparison, distilled water.

The above charts show the typical behavior of blends of a surfactant and an alkaline builder on brass and mild steel. When as little as 2½% or 5% TRITON X-100 was added to sodium tripolyphosphate, detersive action on both metals was found to be superior to that obtained with comparable blends of STPP and a commercial alkyl-aryl sulfonate.

A blend of 2½% TRITON X-100 and 97½% STPP was found to be a better cleaner than one containing 10% aryl sulfonate and 90% STPP. This is a striking example of the superior performance and economy which can be obtained with TRITON X-100.

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then fitting the pictures together in mosaic fashion.

To bolster this point of view, Parker points to the 20,000-bbl./day hydroformer job it's just bringing to completion (*see cuts, preceding pages*). The model was built in 128 man-hours, the key plan was made from a photo in eight. Parker figures, the same job by normal procedures would have required 800-900 hours.

If he has his way, plans will no longer be thought of as "on the drawing boards." Instead, they'll be "in the dark room."

Hydrate Debate

One of the highlights of the meeting of the American Society of Mechanical Engineers in New York last fortnight was a discussion of the use of hydrazine hydrate as a scavenger of oxygen in boiler feedwaters. A team of American engineers and a British investigator reached the same conclusions but with varying degrees of enthusiasm.

The stage for the discussion of hydrazine's practicality was effectively set by Sheppard Powell and Lewis von Lossberg, consulting chemical engineers from Baltimore.

They pointed out that to inhibit corrosion in power plants, it's necessary to remove the oxygen from the water. In the past sodium sulfite has been used. It does a completely satisfactory job in most applications. However, principally because of the resistance to introducing solids to the water even in small amounts, there's been a search for other compounds.

Then Richard Harsman and Eric Woodward, of Olin Mathieson, gave a rundown on how hydrazine hydrate can do the job. A powerful reducing agent, the hydrate (and some other salts of hydrazine) picks up oxygen readily, decomposes to nitrogen and water under mild pressures and at lower concentrations. At higher pressures and concentrations, it decomposes into nitrogen, ammonia and water. But the formation of ammonia is controlled by limiting the dose.

The Olin Mathieson engineers report that hydrazine hydrate effectively controls the amount of dissolved oxygen without contributing to the amount of solids.

Great Britain's Jack Leicester, of Admiralty Materials Laboratory, Dorset, then agreed, in substance, with the American team that hydrazine was a worthwhile tool in controlling the oxygen. However, he pointed out that the mechanism of the reaction is not fully understood and that its application in all types of boiler plants is a question mark.

High-temperature Alloys now Melted and Cast in Stokes High-Vacuum Furnaces

A Stokes high-vacuum melting furnace of 1000-pound capacity at Utica Drop Forge & Tool Corporation, Utica, N. Y. The furnace is to be used for the melting and casting of high-temperature alloys for jet engine rotor blades.

Vacuum furnace melting and casting is the economical method for producing many new metals, with greatly improved properties. Alloys that can stand up in rocket engine combustion chambers and advanced jet engine turbines, metals essential for the construction of nuclear reactors, still other high-purity metals with properties not previously attainable . . . these are just a few of the more than thirty new elements vacuum processing has added to the industrial spectrum.

Vacuum-melted high alloy steels have greater tensile, yield, and impact strengths than conventionally-processed metal, plus greater stress-rupture strength at elevated temperatures, less creep, less brittleness. High-purity iron, processed in vacuum, has 60 to 75% greater stress-rupture strength and 400% more elongation than conventional metal. In anti-friction bearings, vacuum-processed steel has shown an increase of 300% or more in fatigue strength, and given a whole new perspective to the subject of wear-resistance.

Moreover, vacuum processing of alloys conserves critical hardening elements, since there is minimum loss of these metals during melting. More usable metal is obtained from each melt, and virtually all of the scrap can be salvaged by vacuum melting.

STOKES is *building* vacuum furnaces to process these high-purity metals in quantities up to 2000 pounds, and *planning* 5000-pound units. STOKES vacuum furnaces reflect the practical experience accumulated in fifty years of building vacuum equipment. An interesting NEW brochure is ready for mailing on request!

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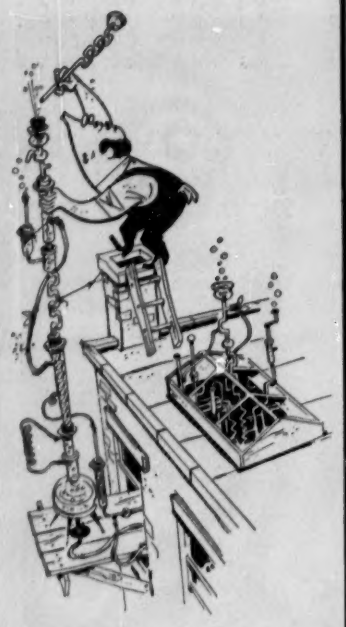
STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment



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Rare organic

in larger-than-laboratory amounts?

● It's easier to ask Eastman to make it for you!

Extensive facilities and wide experience in the preparation of over 3500 Eastman Organic Chemicals for research and analytical work can serve you with compounds hard to find on the market in quantity. We shall be glad to discuss your requirements with you.

Write or wire *Distillation Products Industries*, Eastman Organic Chemicals Department, Rochester 3, N. Y.

DPi

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is a division of
EASTMAN KODAK COMPANY

CONTROL CHARTS: Conferring* on proposed SQC charts, production men, chemical engineers, and statisticians map out the guidelines together.

Statistics Slash Rejects

Overcoming a natural, if irrational, distrust of the laws of probability, production men have been putting statistics to work predicting processing troubles before they happen. One chemical company, satisfied with results shown in a just-completed year-end survey, has decided to extend its statistical quality control program (SQC) to other operations in its organic chemicals department.

Although started only a year ago as a full-scale operation in its Kinetic Chemicals Division, Du Pont's SQC program is now used to control the moisture and noncondensible gases content during manufacture and packaging of its Freon fluorinated hydrocarbon compounds. For the future, the company envisions application of the program to the manufacture of TEL and other gasoline additives, dyestuffs, intermediates, and rubber chemicals.

Quality Plus: As anticipated, the program paid off in improved quality; but more than that, avers the firm, it is expected to result in increased production yields, more efficient use of men and machinery. Perhaps most important is the drop in production rejects to almost zero.

Before the program was started, rejections were running about 20% because of above-specification moisture content in certain-size small cylinders.

But after the first month, the rejection rate dropped to 15%, then to 10% a month later, and after the third month it was running between 0-5%, has held to that level since. Also, specifications were tightened after the second month, and the present rejection rate would actually be about zero under the original specs.

It is difficult to pin a dollar sign on actual savings. The program has been in operation a relatively short time and several phases are still in the development stage. But production men at the company's sprawling Chambers Works at Deepwater, N.J., figure savings will range in the "tens of thousands" of dollars in the first year alone.

In addition to the drop in rejects, plant officials list many other sources of possible savings. Among them:

• Decrease in frequency of resampling operations can save a large amount of both laboratory and supervisory time as well as outlays for repeated replacement of processing and analytical equipment. Before the program was adopted, a laboratory test

*Seated (left to right): Hillman Harris, supervisor of statistical controls for Du Pont's Chambers Works; Arthur Hawkinson, quality control supervisor in the Kinetic area. Standing (left to right): John Page, senior supervisor of the Kinetic manufacturing area; Joseph Meyer, senior supervisor of loading and shipping area.

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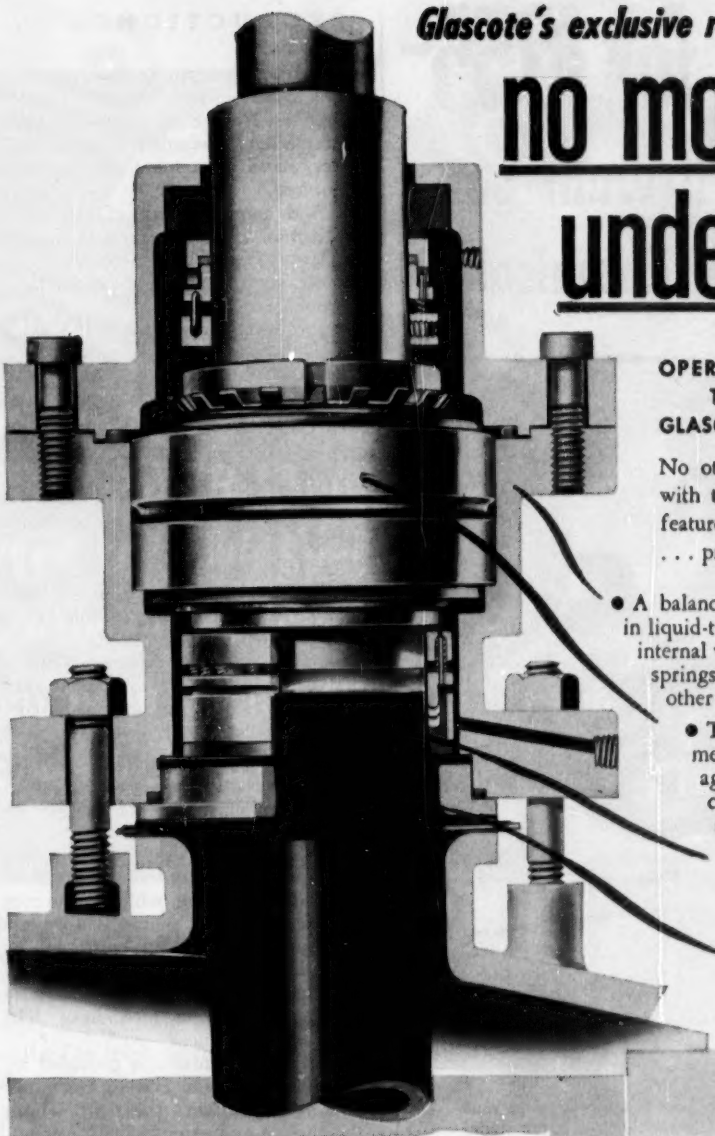

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- Blue color shows how glass lining extends up into the unit . . . past tight-sealing carbon insert. No contaminating material can enter the vessel.
- Ground glass portion of agitator shaft promotes snug fit.

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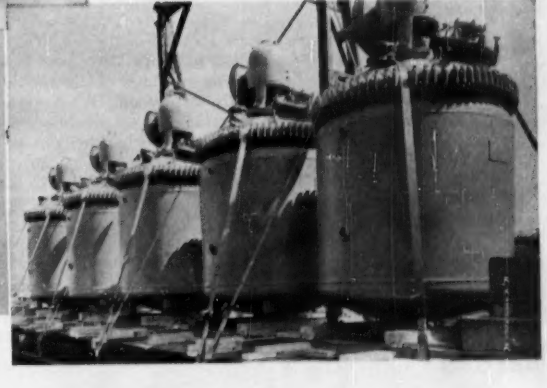

IT was a significant merger indeed when Glascote joined A. O. Smith—world's largest manufacturer of glass-lined steel products. Now A. O. Smith's facility and research in ceramics and metallurgy broaden the working range of Glascote's own technicians.

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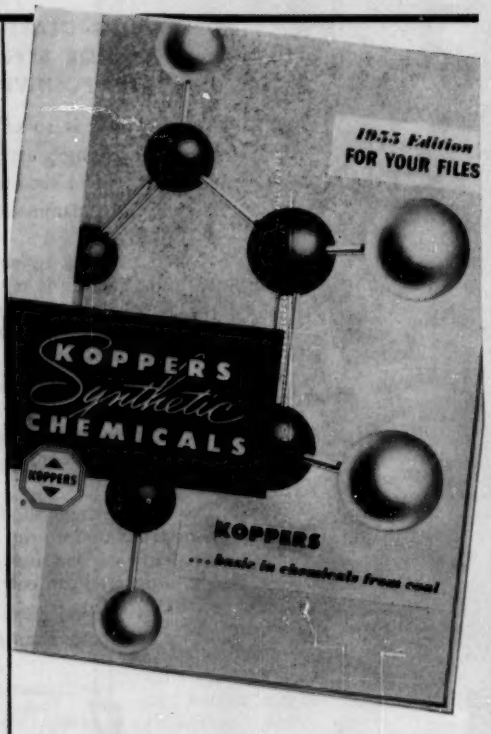
Styrene-Butadiene Latices
Polystyrene Emulsions
"KTPL" Resins
Resorcinol
beta-Resorcylic Acid
Penacolite® Adhesives & Resins
Barium Cyanide
Sodium Cyanide
Potassium Cyanide
Phthalic Anhydride
Mono-tert-Butyl-meta-Cresol
Catechol
Sodium Sulfite
Sulfuric Acid
Meta-Cresol



THIS NEW BULLETIN lists the properties, reactions and uses of the synthetic organic chemicals produced by Koppers. Each of these chemicals has established commercial applications, and in addition, offers rich, new fields of investigation to research and development chemists.

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indicating that production was amiss had to be verified by two additional analyses. Now, SQC makes possible a more reliable judgment of initial analyses, saves on amount of resampling required.

And another result of this is the reduction of production and shipping delays. Possibly, the company believes, such delays may eventually be eliminated altogether.

- Coupled with this is the decrease in rework of production to meet specifications. Greater accuracy and reliability of initial tests because of the mass of data available under SQC makes possible a sizable savings on rework.
- Material loss, which often occurs in rework operations, is also diminished.
- The program saves time spent in finding cause or source of contaminants since it spots trouble more quickly than the old testing system.
- It is also simplifying or eliminating extra processing equipment such as driers that were previously considered necessary.

Scientific Sampling: Statistical quality control programs are, of course, not new; but the increasing acceptance with which they are being met is. It has taken production men a long time to overcome their distrust of "periodic" sampling, which is the core of such programs. There is always a chance, in judging an entire lot by only a sample, that the sample will not be truly representative. Because of this production men have felt: Why take a chance?

Part of the answer is provided by experience like Du Pont's. The other part of the answer, drawn from both the ancient and recent history of manufacturing, comes from the proved superiority of SQC over 100% inspection, which is plagued by human as well as mechanical fallibility.

Once Du Pont's Kinetic Division was sold on SQC, the only major problem in setting up the program was the translation of test data into meaningful charts (*see cut*). Because the company had been running quality tests on the product for years, the chemical engineers had a mass of data to choose from. As a basis for the chart, they decided on a general pattern of quality desired in the finished compound, and as a start made up charts without firm limits.

After the first four months, production men had gathered enough operational data to make up new charts with manufacturing control limits. These limits are constantly reviewed; and, as production experience

4

different types of TRI-CLOVER fittings used to solve specific Corrosion-Resistant piping problems for ELI LILLY & COMPANY

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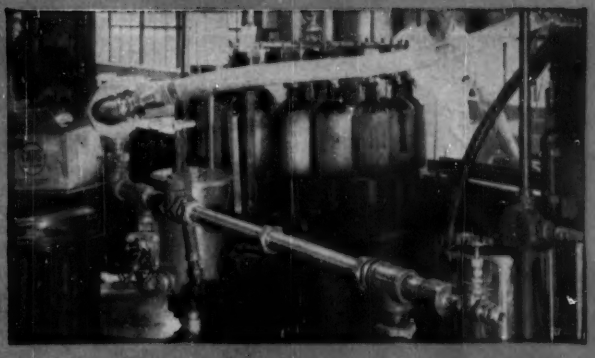
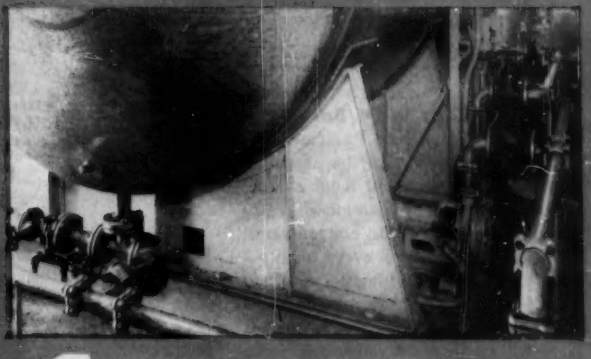
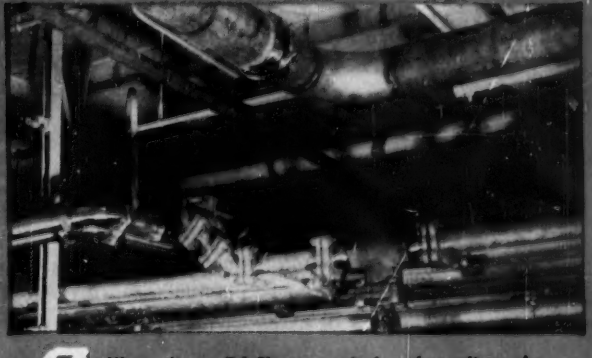


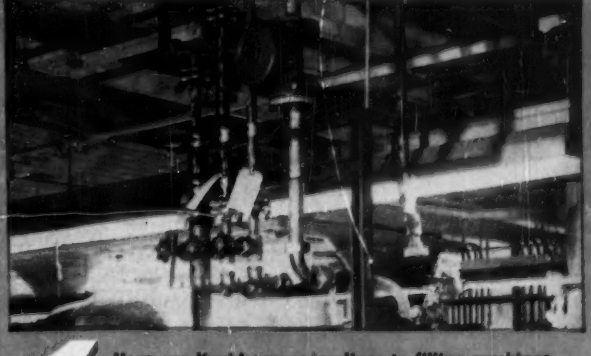
1 Polished *sanitary type* stainless steel fittings are used here in liquid transfer lines to a filling machine.



2 Tri-Clover stainless steel *conical end* fittings are used here in processing Pyrogen-free distilled water.



3 View shows Tri-Clover *conical end, sanitary, Industrial welding* and *Tri-Clamp* fittings utilized in several different liquid transfer lines.



4 Here are liquid conveying lines to filling machines, utilizing Tri-Clover *conical end, sanitary,* and *I.P.S. screwed* stainless steel fittings.

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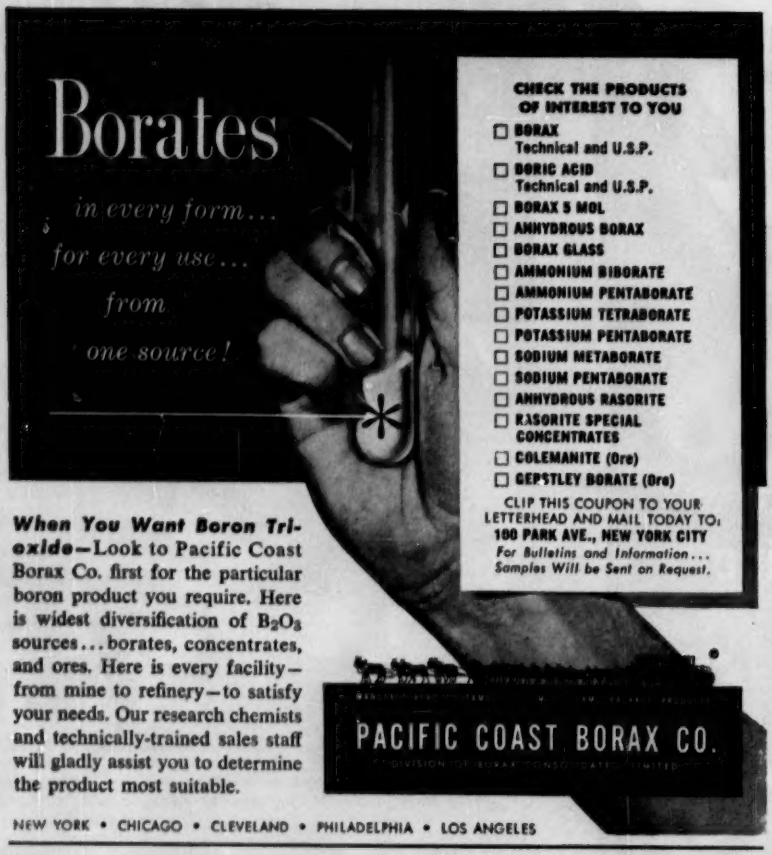
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permits, specifications are narrowed and control limits tightened.

Statistics Significance: A happy but unlooked-for offshoot of this program, reveals Du Pont, is the spirit of rivalry that has developed between its production and sales teams with production arbitrarily adhering to specification limits narrower than those set by the sales groups.

Of a more significant nature, the company counts the improved relationship between plant and laboratory personnel as one of the program's intangible but important bounties, comparable in value to most of the money-saving production angles. Better teamwork between the two is already evident, claims the company, with both groups now having a greater respect for each other's work.

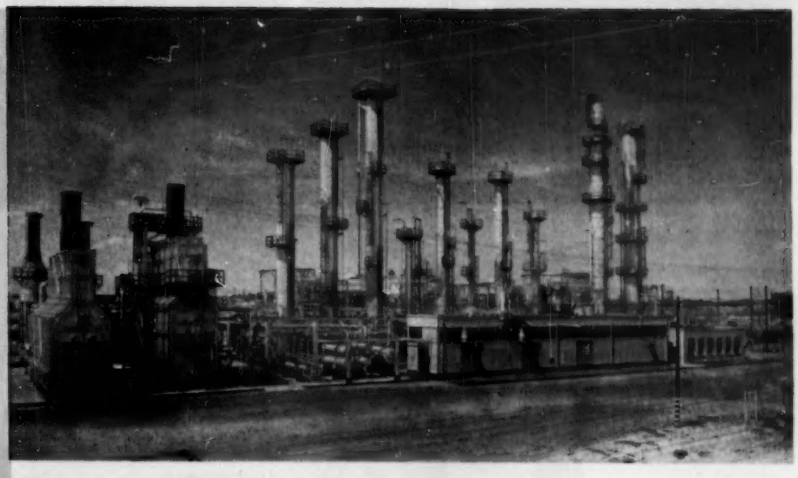
Prior to the program, when tests showed that production was about to go out of specification bounds, plant personnel were often "suspicious," felt the laboratory might be in error. Now plant personnel's confidence in the lab is high; with standardized quality control, explains one production supervisor, the operator in the plant can look at one of the charts and immediately know how he's doing and what to expect.

As well as providing both the supervisor and the operator with a reliable indication of how production is at any given moment, SQC also enables them to call their shots on future production. Previously, they were always looking backward in an effort to control quality, and this is like locking the barn door after the horse is gone.

Too, the program serves to keep everyone on his toes. When trouble occurs the charts can, for example, pinpoint the exact shift on which it started.

What do the production men think of statistical quality control now that they have had a chance to work with it for almost a year? They are, for the most part, more than satisfied. The program, plant men agree, has given the Kinetic Chemicals Division a scientific system of quality control that reduces the chance of human error.

Previous sampling techniques were not calculated on firm statistical ground and it was possible that inconsistencies sometimes entered the picture. This is now eliminated, they believe, under the coldly factual and scientific sampling currently in use. Also, it's given production men a more effective tool for measuring and judging their performance, making their efforts more effective.



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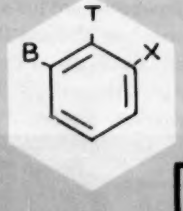

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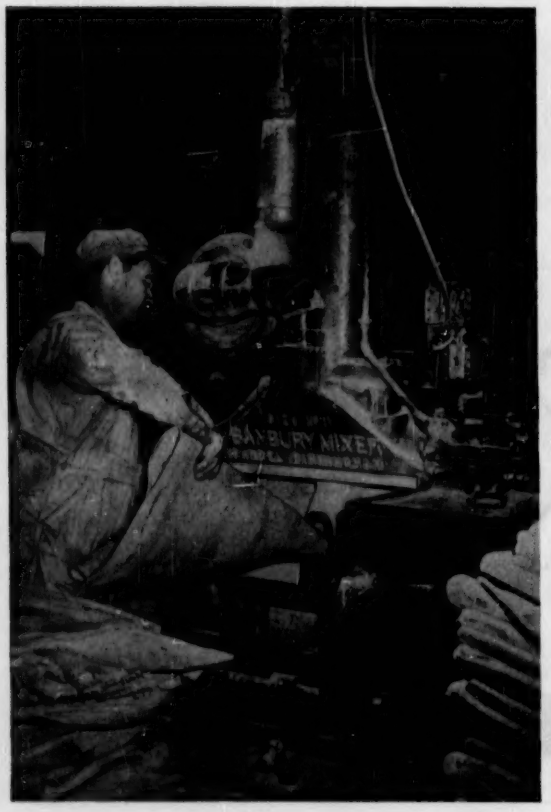

Uniform coating of zinc stearate makes rubber easy to handle yet is readily absorbed during cure.

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Chemical Newsfront

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CW 12-54

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INSTALLING SOCONY'S MOBILAC: For research, an answer to trial and error.

Research by the Numbers

It's quite clear that electronic computers still cannot supply foolproof election predictions. But they can and do save costly trial-and-error lab experiments by making short work of once-prohibitive mathematical calculations. That's behind the mounting popularity of automatic computers in the chemical process industries—it's why Socony-Vacuum last week installed at its Paulsboro, N.J., research laboratory the biggest and fastest electronic "brain"* in the petroleum industry.

A variegated diet of research and engineering problems will try to appease the machine's voracious appetite for figures.

Director of laboratories, William Holaday, expects it—in combination with a mass spectrometer (for identifying the molecular structure of hydrocarbons)—to speed the detailed analysis of crude oil, waxes, and lubricating oil stocks, lead to improvements in the quality of finished lubricating oils and waxes.

But the computer's first job will be in process development and improvement studies. To capitalize on its talents, Socony-Vacuum scientists have constructed a mathematical model of the Paulsboro refinery, using numbers and formulas to represent process operations. About 100 equations mathematically express the behavior of catalytic crackers, reformers, and other refinery units. These equations, punched into cards, will be fed to the "brain" for reading and retention in its memory circuits.

When data on new process and product requirements are supplied to the computer, it will tie them in with its basic knowledge, disgorge the required operating information.

Called Mobilac, the Socony device is the product of ElectroData Corp. (Pasadena, Calif.), an affiliate of Consolidated Engineering Corp. It can solve problems in algebra, calculus, or logic, add 500 ten-digit numbers a second, perform 120 ten-digit multiplications and 85 divisions a second. And its memory encompasses more than 4000 ten-digit numbers.

Earlier this year, a team of five Du Pont researchers* gave a convincing demonstration of how a computer, single-handed, can solve a practical chemical research problem. They used Massachusetts Institute of Technology's Whirlwind computer to determine operating conditions that would discourage the formation of a coke-like scale on the walls of a chemical reactor. Because of the many possible combinations of synthesis temperatures, pressures, and times, the mathematical solution of the problem was extremely complex.

MIT's Whirlwind whipped out the answer in 30 hours (about 1270 times faster than a man would have required), upped the reactor's production rate by 25%.

As a result of this trial, Du Pont researchers proved that computers could be used as experimental chemical reactors, eliminating the costly, time-consuming often-hazardous method of actual runs under varying conditions. The implication is clear: robot brains will play an increasingly important role in synthesis work, pilot operation and plant design.

Right now, Du Pont is renting a Remington Rand Univac machine on a two-year basis (with an option to buy). In addition, the company has rented (at $300/hour) an IBM 701 computer (at IBM's New York computing service) to work out problems requiring from 18 minutes to 25 hours of computing time. Union Carbide, Dow and Monsanto have also availed themselves of this service.

U.S. Steel Corp., moreover, has just installed a Univac at its Gary, Ind., works. The new machine is the company's second; the first was installed at National Tube Division (Pittsburgh) in August. Both are available for research use, though they were not purchased exclusively for that purpose.

A list of computer owners and/or users would read like a cross-section of industry. And the research problems they're tackling are about as varied. These range from chemical analysis to seismic wave calculations. Many of these studies have fundamental import to the chemical industry.

At IBM's Watson Laboratory, located on Columbia University's New York campus, lab director Wallace Eckert is using IBM's new NORC computer (*see box p. 90*) on some basic studies of the nature of the atom. This machine's high speed (a million calculations per second) now condenses to a reasonable period of time the billions of calculations that are required in such investigations.

The IBM 701, has demonstrated its versatility by translating Russian into English (*CW, Jan. 30, p. 46*), a *tour*

*A twin is slated for installation early next year at Magnolia Petroleum Co. (Dallas, Tex.), Socony-Vacuum's affiliate in the Southwest.

*Polychemicals Dept.'s W. Henry Linton, Jr., Robert Gee, Robert Maier, and J. Walter Raines; Engineering Research Laboratory's John Reutler, Jr.

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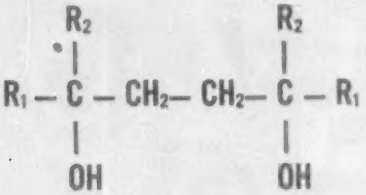
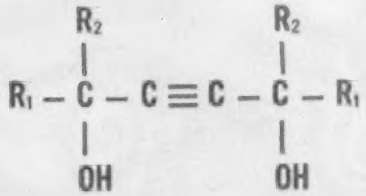
DITERTIARY SATURATED GLYCOLS 				Organic syntheses. Dimethyl Hexanediol leads to the insecticide, allethrin, through the dehydration product, dimethylhexadiene. Tetramethyltetrahydronapthols from alkylation of phenols are of interest as antioxidants. Dimethyl Octanediol is suggested as a high temperature solvent and as a component of lubricants, cutting oils, and similar formulations where high temperature properties are important. An unusually surface active glycol which is generally synergistic with other surface active agents, its trial is suggested particularly in polymerization systems and in highly alkaline media.
Dimethyl Hexanediol	214-215	88.5-89	0.6	
Dimethyl Octanediol	241-242	44	2.2	
DITERTIARY ACETYLENIC GLYCOLS 				Many uses of these glycols depend on their surface activity. Non-ionic in action and completely free from foam, the "Surfynols" reduce surface tension of water to 32-34 dynes/cm. They generally show synergism with other surface active agents. Applications allied to surface activity include – pigment and resin dispersion, in industrial and dish-washing detergents, viscosity reduction and control of gelation of plastisols and water soluble gum systems, foam suppression. Dimethyl Hexynediol – as a portion of the polyol reactant to give modified properties to alkyd, polyester, and isocyanate resins. Dimethyl Octynediol – as an HCl acceptor in stabilizing chlorinated polymers.
Dimethyl Hexynediol	205-206	94-95	27.0	
Dimethyl Octynediol ("Surfynol" 82)	222	55-56	8.8	
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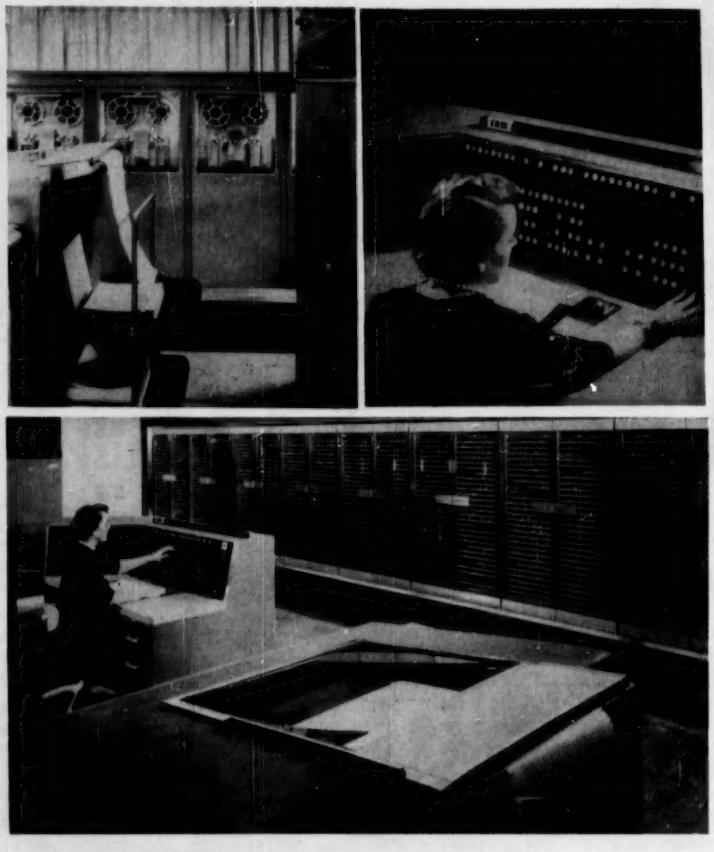
de force that, if carried further, could prove a real boon to snowed-under literature searchers.

At Gulf Oil Co.'s Harmarville, Pa., laboratories, an electronic brain made by National Cash Register Co.'s electronics division is expected to handle such formerly impractical projects as numerical coding of the atomic structure of hydrocarbons (*CW, Sept. 18, p. 50*).

And California Research Corp.'s Richmond chemists are putting a computer to work in gasoline blending (*CW, March 6, '54*).

Alternative: Giant computers like Norc and Univac, costing millions of dollars, are a pretty steep investment for most firms. Fortunately, many of the problems facing researchers can be solved on lesser electronic brains, and even these needn't be bought outright.

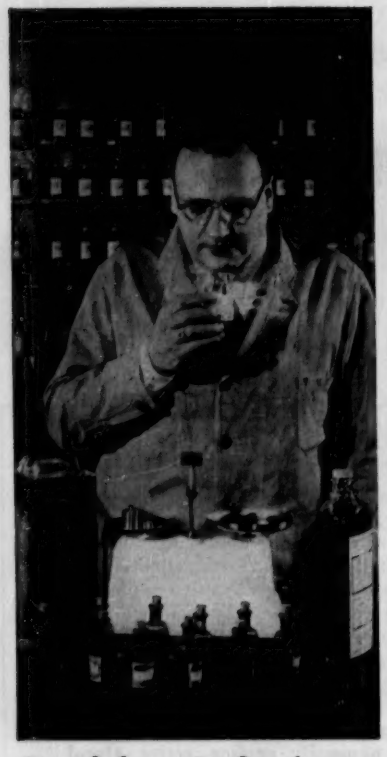
IBM brings computer service to industry via its applied science division,



The Fastest Lightning Calculator

Flashing through a million calculations a second, IBM's NORC (Naval Ordnance Research Calculator) sets a new high in computing speed. But like its slower kin, it must be fed well-digested information prior to doing its mechanical brainwork. Ultra high-speed magnetic tapes (*top left*) feed in data and operating instructions, also store intermediate results. The console (*top right*) controls the computer; the faces (*to operator's left*) of cathode-ray tubes show any number or instruction in the calculator, permit inspection while the machine is operating. NORC prints its answers (*bottom*) at the rate of 18,000 characters/minute, simultaneously provides a running progress report and record of results.

The most highly refined robot "brain" yet produced, NORC still can't think for itself. Its answers are only as good as the questions it is asked.



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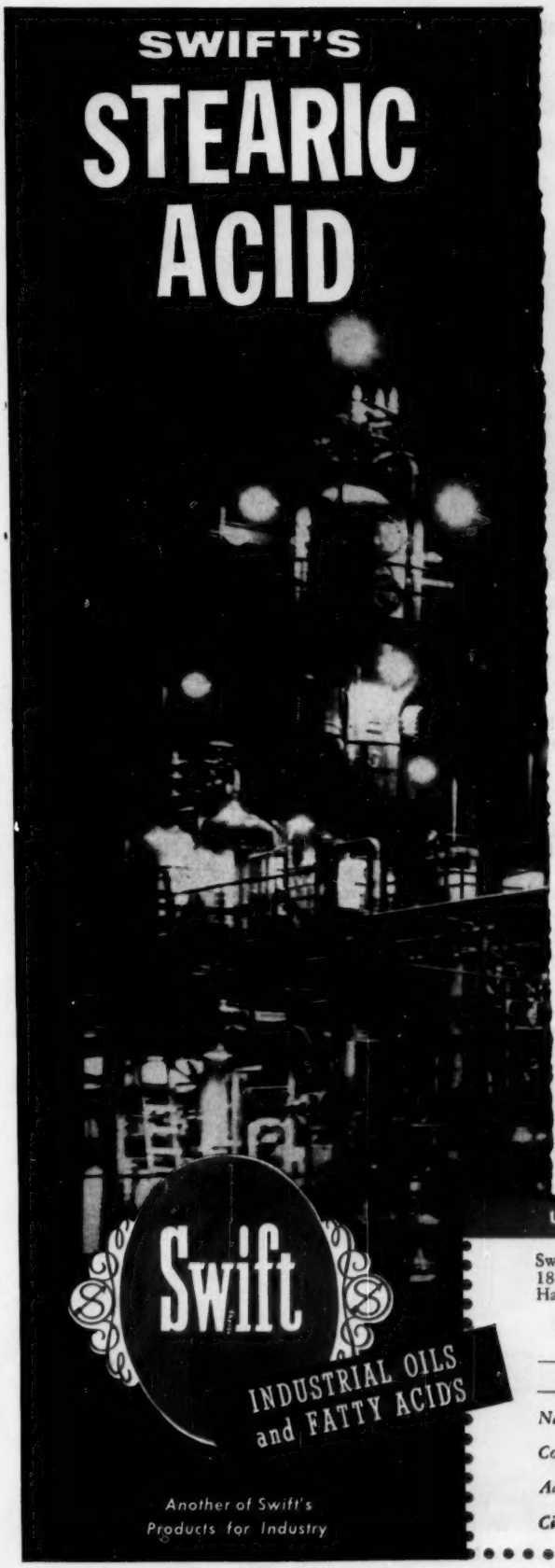

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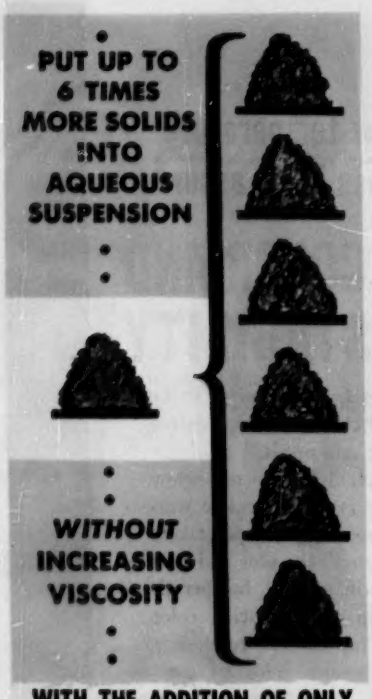

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IBM'S DE CARLO, HURD, AND HUNTER: Electronic "brain" brain-trust.

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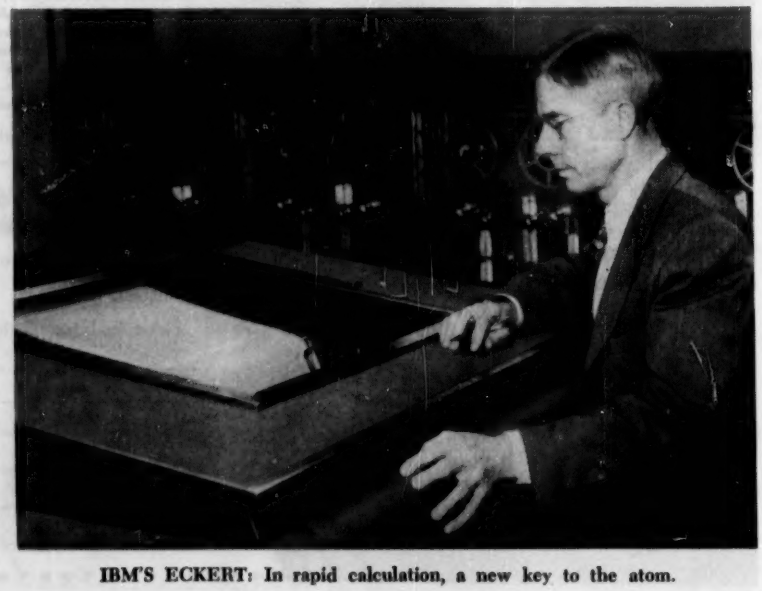
Their function breaks down into two parts: a contract computing service (with a staff of 40 to help plan and analyze problems), and a nationwide field organization (about 75 representatives) to consult with customers on how to handle their particular computing needs.

On the main floor of IBM's New York offices, a 701 computer works round the clock, quietly grinding out answers to the accompaniment of a galaxy of flashing lights on the control board. The company has maintained this scientific computing service since 1948.

Across the country, the firm maintains nearly 200 offices through which appointments can be arranged with applied science representatives concerning any problem that might lend itself to attack by automatic computers.

Computing service is a popular way to handle occasional problems that don't justify buying or even renting a machine. Some manufacturers of computing machines will take on computing problems, at reasonable rates,



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largely to gain experience in solving typical customer problems. Also, several firms have purchased or rented computers solely for doing outside problems.

A partial list of companies offering computing service includes Remington Rand, Inc. (New York), Raytheon Manufacturing Co. (Waltham, Mass.), Mathematical Computing Service (Bayside, N.Y.), Telecomputing Corp. (Burbank, Calif.), and National Cash Register's electronics division (Hawthorne, Calif.).

The rising star of electronic computers in industry is highlighted by some salient figures. Remington Rand has received three new orders for its giant Univac system; this makes 39 such machines now in use or under construction. Twenty-two of these have already been installed at monthly rentals averaging $25,000. Univacs are priced in the million-dollar bracket, and the company will either rent them with option to buy, or sell them outright. In addition, the company has orders for 237 junior Univac systems, renting at about $1200 a month, with about 105 delivered.

Thomas Watson, Jr., president of IBM says his firm now has orders for more than 1400 lesser electronic "brains." IBM has about 2500 electronic machines presently being used in industry and government. A substantial portion of the new production is earmarked for industry.

All told, there are about 120 companies that make computers or computer components; only about a dozen of these produce complete machines. All, however, are helping forge the weapons needed to achieve industrial science's next clear objective—the reduction of all research problems to mathematical concepts for electronic brains to ponder and solve.

Beyond the Barnyard

From their vantage position atop the heap of livestock feed supplements, antibiotics are eyeing a nutritional market beyond the barnyard fence. This week their stock climbed with the results of tests in India that highlight the wonder drugs' potential in human feeding.

Pfizer's Terramycin was used in these studies, but Lederle's Aureomycin is also under investigation.

Supervised by staffers R. S. Satoskar and R. A. Lewis of Seth G. S. Medical College (Bombay), the new studies are reputed to show that a minute amount of Terramycin may be able to substitute for an extra slice of meat in the human diet. What the antibiotic actually does is permit the body to utilize more of the protein of ingested food.

At least that's what the Indian researchers discovered in limited studies with students subsisting on low-protein diets.

They gave 14 of their students small daily doses of antibiotic and vitamin B_{12}, periodically analyzed their blood-protein make-up. The students were divided into three groups: one received only the antibiotic; another the vitamin, alone; and the third was given both.

After two months, all of those who received Terramycin (alone or in combination) showed higher-than-usual blood-protein levels. The group that took only the vitamin experienced no blood-protein increase.

The protein-enhancing activity of Aureomycin was uncovered in recent tests with Mayan Indian children on low animal-protein rations. Conducted by researcher Nevin Scrimshaw, of the Institute of Nutrition of Central America (Guatamala), these studies revealed that children who received Aureomycin consistently registered higher monthly height increases than control subjects. Penicillin gave variable results in comparable tests.

How antibiotics confer their growth-promoting advantage is still a mystery. Current theory holds that they alter the intestinal bacterial population, which plays an important role in digestion and absorption of food.

A great deal of research still lies ahead, but if antibiotics prove out in human nutrition, undernourished millions will be more concerned with what the drugs can do than how they do it.

•

De-ionizer: For purified water at low cost, Labline Inc. (Chicago) offers a new cabinet-type demineralizer with a rechargeable resin ion-exchanger in self-contained returnable plastic cells. Called Ion-Mizer, the unit produces water meeting U.S.P. XIV requirements for purity at an approximate cost of 3¢/gal. Its top capacity is 200 gal./hour.

•

Pigment Lab: Just completed at Du Pont's Newark, N.J., pigments plant is a new laboratory for pigment research. Officially opened this week, the lab will consolidate research formerly conducted at several locations in the plant. J. Nelson Tully will head the lab.

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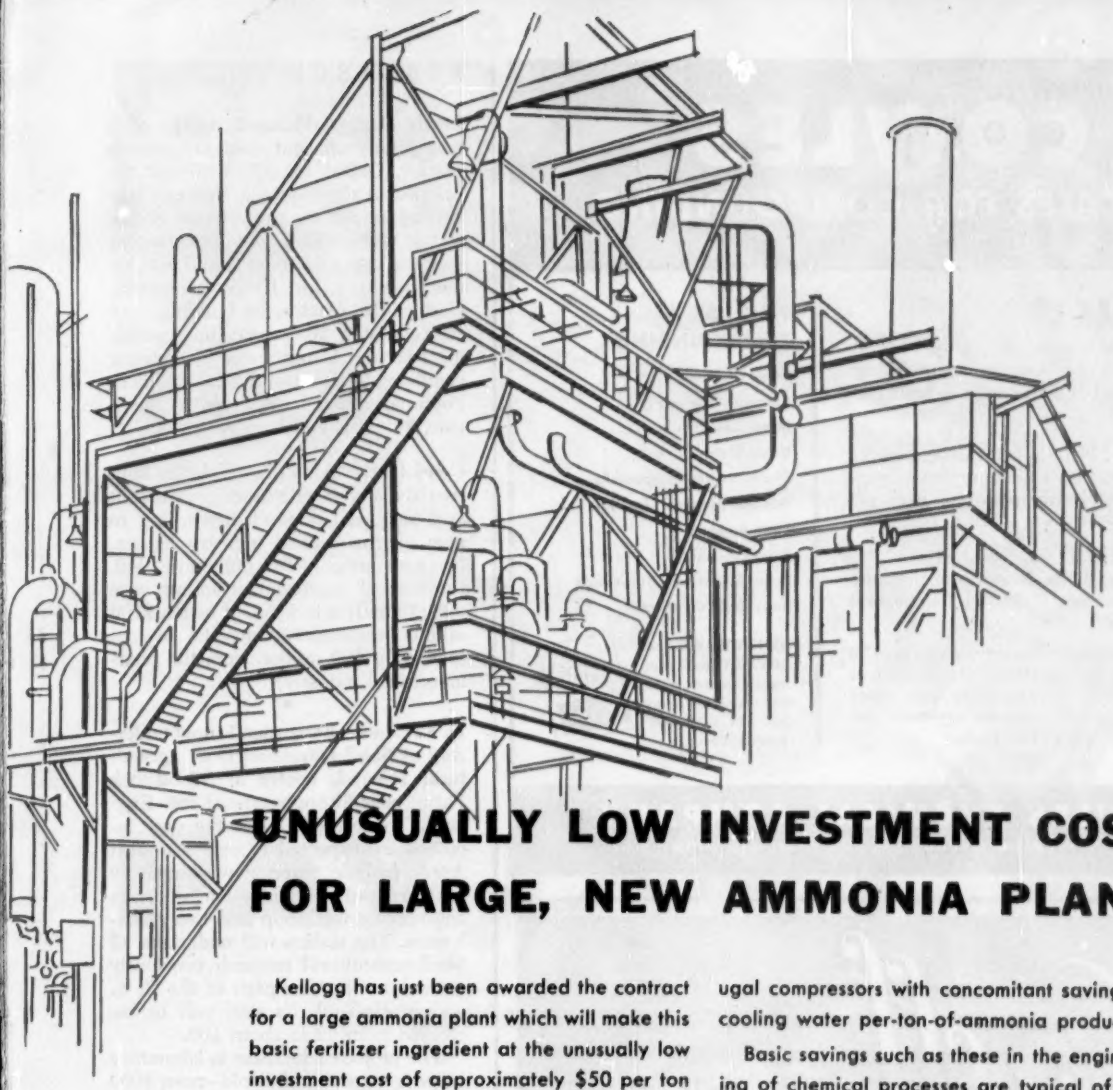
Atomic Tool: In a recent address before the Executive Club of Chicago, Atomic Energy Commission chairman



UNUSUALLY LOW INVESTMENT COST FOR LARGE, NEW AMMONIA PLANT

Kellogg has just been awarded the contract for a large ammonia plant which will make this basic fertilizer ingredient at the unusually low investment cost of approximately $50 per ton of annual capacity.

The plant, scheduled for completion in mid-1955, will be erected near Lima, Ohio, for The Standard Oil Company (Ohio). It will produce 300 tons of ammonia daily.

The major reason for the reduction in investment lies in the fact that the process employs only one ammonia synthesis section. Furthermore, operating experience with Kellogg ammonia converters has shown that they can be substantially reduced in size as can the heat exchangers without lowering capacity.

From the standpoint of operating costs, the new plant will have electrically-driven centrifugal compressors with concomitant savings in cooling water per-ton-of-ammonia produced.

Basic savings such as these in the engineering of chemical processes are typical of Kellogg's *Engineering for Tomorrow* — creative engineering that can increase the profit potential of any chemical or petrochemical project.

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RESEARCH . . . . . .

Lewis Strauss disclosed details of a new highly efficient nuclear research reactor. Called the CP-5, it was developed at the Argonne National laboratory under the supervision of director Walter Zinn. Strauss estimates that 100 kg. of uranium would provide the inventory for 15 such reactors. Cost of the reactor, its building, and an associated laboratory (but excluding fuel and heavy water moderating components) is around $2.25 million. Potential research uses are in medicine, industry, and basic research.

•

Consistent: Medical research has kept pace dollarwise with other government and industrial research, according to new pharmaceutical industry figures. From an outlay of $45 million in 1940, the cost of medical fact-finding rose to $173 million in 1953, of which $100 million came from private sources (including $60 million from the pharmaceutical industry).

•

U. K. Center: Expansion is now underway at Shell Petroleum Co.'s agricultural research center at Woodstock Farm, near Sittingbourne, Kent, England. To cost $420,000, the new facilities are expected to be ready next April, include three new laboratory buildings, an administration block, an engineering workshop and two greenhouses. The station will undertake all Shell agricultural research previously carried out in other parts of the U. K. and in Holland. Its staff will be increased from 32 to about 100.

The projected increase in laboratory space is more than fivefold—from 4000 to 21,000 sq. ft. Shell's comparable agricultural research center in the U.S. is at Modesto, Calif. The company also researches agricultural chemicals at its Denver, Colo., laboratories.

•

Solubility Equation: Tedious solubility measurements can be bypassed—says U.S. Dept. of Agriculture—by a new method of Southern Regional Research Laboratory's E. L. Skau and R. E. Boucher. They have related the solubilities of homologous long-chain organic compounds to the number of carbon atoms in their molecules. When the molar solubilities of such compounds are plotted (on a logarithmic scale) against the number of carbon atoms, solubilities of the missing members can be predicted by interpolation or extrapolation, since the solubilities of the complete series fall on a smooth curve.

Thus far they've plotted published solubility data for homologous fatty acids, their methyl esters, primary amines, symmetrical secondary

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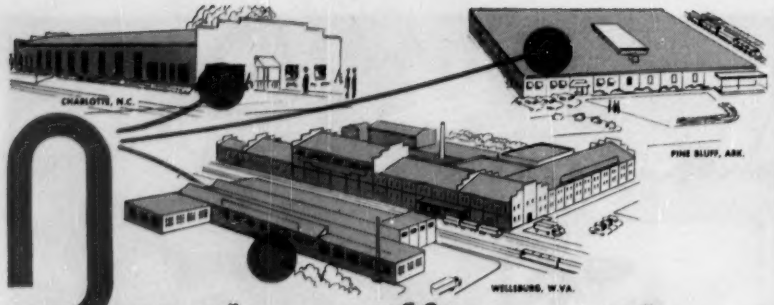

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RESEARCH . . . . . .

amines, primary alcohols, symmetrical ketones, nitriles, amides, anilides, N, N-diphenylamides, and esters of stearic acid, in such solvents as benzene, cyclohexane, carbon tetrachloride, chloroform, ethyl ether, glacial acetic acid, ethyl acetate, butyl acetate, acetone, butanone, methanol, 95% ethanol, isopropanol, n-butanol, nitroethane, acetonitrile, and water.

It's expected the find will prove to be of importance to industrial processors of vegetable fats and oils, as well as to researchers investigating these commodities.

•

Government Reports: A clutch of new reports from the U.S. Dept. of Commerce, Office of Technical Services (Washington 25, D.C.), cover some recent chemical studies.

• "Development of furane resin glass fabric base plastic laminates" (PB 111418, $1) describes research leading to a low-pressure glass-fabric-base plastic laminate with flexural strength up to 65,000 psi., and edgewise compressive strength up to 40,000 psi. The study includes partial polymers of low and medium molecular weight, gives details of test methods, behavior of catalysts, etc.

• "Foamed-in-place plastic sandwich construction, metal faced" (PB 111417, $1) is a research report on the alkyd-isocyanate foamed-in-place technique for producing sandwich construction, the preparation of metal surfaces, various types of coatings tested, materials and procedures used. It also includes references for a more detailed study of foamed-in-place techniques.

• "New high-temperature intermetallic materials" (PB 111413, $2) is a report on Air Force research aimed at the development of new refractory materials. Promising candidate: a composition made of 95% Cr_2Ti and 5% Cr_2O_3. It shows, according to the Air Force, excellent high-temperature properties, including good oxidation resistance and rupture strength.

• "Titanium bibliography" (CTR-306, 50¢) is a compilation of more than 300 research reports detailing government investigations into the basic metallurgy of titanium. Intended for industry, the publication contains special listings for titanium alloys, and carbides, nitrides and oxides of the metal.

• "Volatile rust inhibitors" (PB 111407, $1), prepared by Naval Research Laboratory, summarizes information available on the properties, application and performance of more than 100 amine salts of weak inorganic acid and amine-organic complexes that have rust-inhibiting activity.

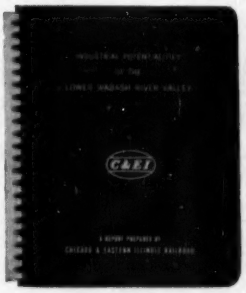
Why is this the Success Area for Plant Sites

There are many reasons why the Lower Wabash River Valley is the fastest growing manufacturing area in the country.

For example, there is no question about fuel; it is a leading coal producing area and most of the major gas lines cross the area. Electric power? Of the more than 40 generating stations located here, two are among the world's largest. Labor? The area has a population of 2½ million. Transportation? It is the hub of a 9000-mile inland waterway system—it is served by over 20 major railroads and has well maintained highways. Chemicals? There is abundant fluorspar, high calcium limestone, dolomite, rock asphalt, phosphate rock and barite to name just a few mineral materials. And, many other raw materials are in or near this area located between supplies and markets.

Write for this new *INDUSTRIAL FORE-SITE Guide

This fact-filled book of more than 400 pages is a comprehensive economic study of the Lower Wabash River Valley. Contents include a geologic map and cross sections—maps of inland waterways and major railroads—freight schedules—power supply details and electric rate charts—locations and sizes of gas lines—the water supply for specific towns—crop and livestock production by counties—forests and timber resources—population characteristics—types, locations and sales of wholesalers and retailers—plus a full description of each of the 20 major industry groups.



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AERO* Acrylonitrile, a highly stable bi-functional chemical, is finding increasing use as a reactive intermediate. Its versatility is indicated by its use in the preparation of pharmaceuticals, insecticides, surface active agents, and many other useful products as well as by direct application in the broad fields of rubber, plastics and textiles. Its polymers and copolymers can be formulated to add many desirable properties to today's products and to create interesting new products for the future. The following items and abstracts, gathered from many sources, indicate a few facets of current research with this versatile chemical.

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METHOXYPROPYLAMINE, A *Cyanamid* DERIVATIVE OF ACRYLONITRILE, CAN BE USED FOR EMULSIFYING RESINS AND WAXES. Soaps formed by reacting fatty acids with the amine are particularly advantageous in that approximately constant alkalinity is maintained during the drying of emulsions. Floor finishes, textile finishes and water paints are products in which the amine is effective.

A COMPOSITION BRAKE-BLOCK CONTAINS ACRYLONITRILE-BUTADIENE AS A BONDING AGENT. The copolymer, used as a matrix binder for iron particles, asbestos and other nonferrous products, is vulcanized so that the block is resistant to heat and wear.

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(Some or all of the above items are covered by U.S. or foreign patents)

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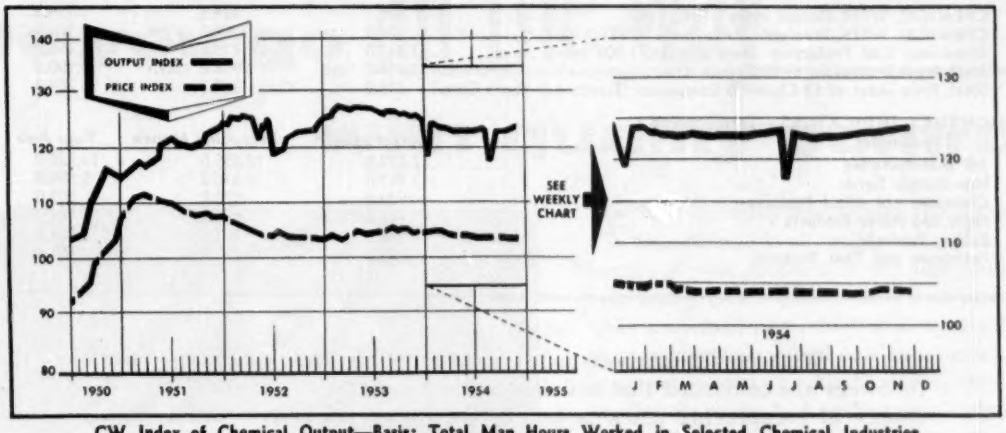

CW Index of Chemical Output—Basis: Total Man Hours Worked in Selected Chemical Industries
CW Price Index—Basis: Weekly Prices of Sixteen Selected Chemicals

MARKET LETTER

Interwoven through this past week's market activities were threads of mixed price trends. Hikes on some chemicals and allied products contrasted sharply with declines on others. For example, acetylsalicylic acid (aspirin) producers boosted prices 5-10%, while tags on lithium hydroxide monohydrate were slashed an average of 15%.

The analgesic increases were initiated "to reflect higher manufacturing costs." Output, too, continues to mount: latest available monthly figures (for September) register some 15,600 lbs. over the previous month — 1.15 million lbs. vs 1.14 million; total production for the year is expected to top '53's 13.7 million lbs., may go as high as 14.5 million.

•

Expanded production is behind the lithium hydroxide monohydrate price drops. Foote Mineral's move—lowering all price brackets—emphasizes the increased quantities of material now flowing out of its Sunbright, Va., and Kings Mountain, N. C., plants. The action, too, says a company official, confirms an "established policy of encouraging greater usage of lithium in industry."

Typical of the new prices, on a delivered basis to Canada, U.S., and f.a.s. N. Y. or Philadelphia, are carlots or truckloads at 97½¢/lb.; less than 325 lbs., $1.13/lb. Prices covering contract orders are ½¢ lower.

At the same time, Foote adjusted tags on lithium fluoride from an f.o.b. plant basis to a delivered basis.

•

Consumers of cellulose acetate molding compounds are reaping benefits this week as a result of some intense elbow-nudging for markets. "To be competitive," is the way Eastman Chemicals describes its price reductions. Within hours Celanese posted similar schedules. The third major maker, Hercules, hasn't yet made its move officially, but indicates to *CW* it will—albeit reluctantly—follow suit this week.

Trade-labeled Group-Three cellulose acetate molding compounds (dense colors and virgin black), are down to 36¢/lb. (l.c.l.) from a previous 42¢. Carload quantities in a single color are pegged at 35¢/lb. Some compounds in Group Four (offered by Eastman and Celanese) are lower than that.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
CHEMICAL WEEK Output Index (1947=100)	125.0	124.5	124.8
CHEMICAL WEEK Wholesale Price Index (1947=100)	104.3	104.3	104.9
Bituminous Coal Production (daily average, 1,000 tons)	1,417.0	1,470.0	1,395.0
Steel Ingot Production (1,000 tons)	1,944.0 (est.)	1,958.0 (act.)	1,900.0
Stock Price Index of 13 Chemical Companies (Standard & Poor's Corp.)	375.0	362.7	264.3

MONTHLY INDICATORS—Employment (Thousands)	Latest Month	Preceding Month	Year Ago
All Manufacturing	12,679.0	12,655.0	13,326.0
Non-durable Goods	5,447.0	5,516.0	5,559.0
Chemicals and Allied Products	529.0	528.2	503.0
Paper and Allied Products	442.1	439.9	449.5
Rubber Products	208.2	205.1	204.5
Petroleum and Coal Products	175.0	175.6	184.3

With general-purpose polystyrene currently at 30½¢, a few trade followers are convinced that cellulose acetate materials now stand a good chance of recapturing markets lost to the former in recent years. Both vie for packaging, toys, housewares, other outlets.

•

Hope of opening up new markets for acrylic plastics is advanced by Rohm & Haas as the reason for lowering prices. Plexiglas R, a just-now commercially available cast sheet, is priced 10-25% less (depending on thicknesses and sizes) than the company's standard Plexiglas sheet.

Targets: such outlets as signs, industrial glazing, dome skylights, lighting fixtures.

•

More concerning titanium (*see p. 106*): a second round of expansion that could push the target up to at least 50,000 tons capacity by 1958 (some 20,000 tons more than currently scheduled) is still a long way off.

Defense planners, set to announce the higher figure a few months ago, were held back by realization that military titanium consumption (about 1,200 tons) will fall far short of estimated '54 requirements set two years ago. Probes are now under way on why military use for this year isn't up to anticipated levels.

So far, Washington has unearthed some general reasons for the unexpectedly low consumption: cracking and embrittlement problems with titanium alloys; lack of uniform quality in both sponge and alloys; high cost, expecially of fabricated shapes and components.

Government experts, however, aren't dismayed by these findings, explain it's the sort of thing normal in any infant metals industry. Titanium development has been going on for only 5 years—a short stretch compared with, say aluminum's.

SELECTED CHEMICAL MARKET PRICE CHANGES—Week Ending December 13, 1954

UP

	Change	New Price		Change	New Price
Acetophenetidin, USP, bbls., works, frt. equald.	$ .02	$1.17	Molybdenum trioxide, tech., kgs., works, basis Mo content	$.09	$1.25
Acetylsalicylic acid, standard, fine, powd. (80 mesh), bbls., 1000-lb. lots	.03	.58			

DOWN

	Change	New Price		Change	New Price
Cellulose acetate, molding compounds, Group III, l.c.l.	$ .06	$ .36	Chloral hydrate, USP, 40-lb. jars, 1000-lb. lots	$.30	$1.00
Single colors, c.l.	.06	.35	Lithium Hydroxide monohydrate, dms., ton lots	.065	1.035

All prices per pound unless quantity is stated.

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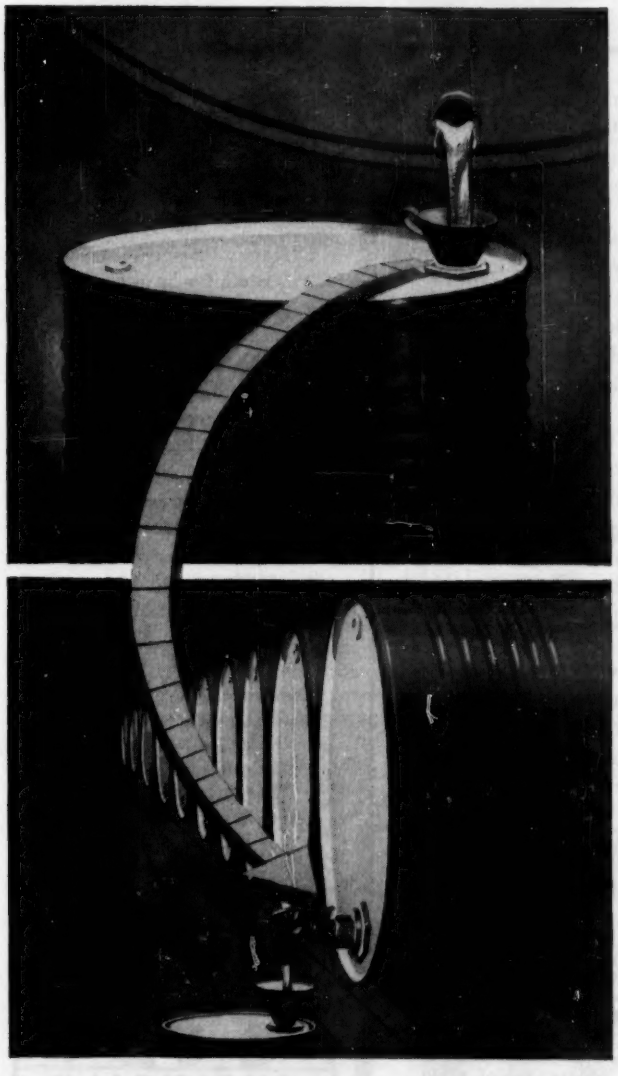

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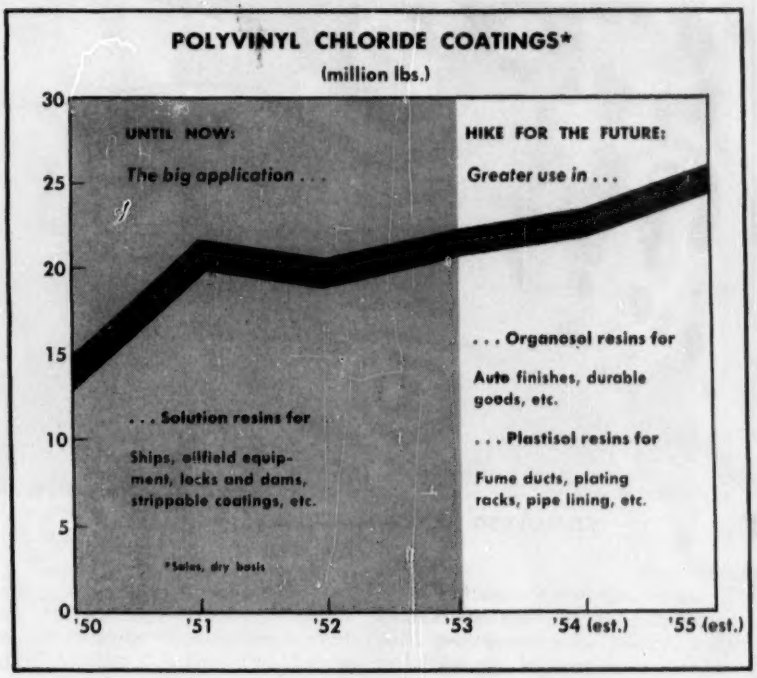

Dash for Dispersions

Today marketers of polyvinyl chloride and copolymers are getting set for an all-out race to boost their 23.5-million-lb. sales of protective coating resins.* Reason: across the country, interest is being kindled in the organosol and plastisol methods of applying these resins as protective coatings.

Right now PVC makers are assessing response to the most recent commercial applications of organosol vinyl resin coatings—for example, the upper instrument panel of the 1955 DeSoto automobiles (*see cut*), and the back panels of fold-down rear seats in 1955 Plymouth and Dodge station wagons.† The chances are good, too, that the same finish may be seen soon on various business machines.

There's no stint of effort, either, to get PVC organosols on automobile top-coat finishes. This fat potential is the bait: annual output of new passenger cars alone (not to count trucks and buses) is near the 5.5-million mark, and some 4 gal. of alkyds or nitrocellulose lacquers are consumed per unit as body paint. It's no wonder, then, that PVC makers are already probing this market, think that with the organosol technique they'll have the entree.

Old Method, New Start: The uptilting favor now shown organosol and plastisol vinyl protective coatings (terms reserved chiefly for PVC and acetate copolymers) is actually a suddenly revived interest in a 10-year-old film formation method.* To date the bulk of all PVC-PVAc resins used for protective coatings have been applied as solution coatings. The vinyl resin is dissolved at room temperature before application in such solvents as methyl isobutyl ketone, methyl ethyl ketone. The organosols, however, hold the resin in suspension, rather than in solution, before application.

After it's applied, the suspended vinyl resin of both organosols and plastisols is fused by raising the temperature until the dispersant becomes an active solvent for the resin in the range of 250-350 F. Thereby the resin becomes soluble in the combination of diluents, and fuses to a continuous film.

Similarly, the plastisols are vinyl dispersions in which the plasticizer comprises the entire liquid phase. By this development the resin coater has eliminated the solvents and attendant fire or toxicity hazards.

Although PVC makers are hustling to popularize these two coating techniques, organosol- and plastisol-dispersed vinyl resins are barely making a dent in the present consumption of PVC-PVAc resins for protective coatings. Vinyl copolymer producers expect a definite trend to the use of organosol and plastisol dispersions next year, are aiming for markets such as automotive finishes, durable appliance finishes (refrigerators, freezers, stoves, etc.), wire coatings, to mention but a few.

Those who sing out the sales slogans for these markets will, of course, tout these principal advantages of the organosol vinyl resin dispersions: rugged durability, high weather resistance, and good gloss retention of the final coat. Auto owners, too, may expect fewer repaint jobs; for the toughness of an organosol vinyl exterior finish, it's claimed, will ward off dents that would chip through an average alkyd finish down to the metal of the car.

Doubts vs Field Tests: There is doubt, however, in some quarters concerning the organosol vinyl coats' dependable durability. Nonetheless, vinyl makers are quick to predict that the organosol finishes will prove to be top-rate exterior finishes as soon as autos so finished are given field tests. The textured organosol finishes mentioned above will, of course, also provide one of the first field tests for interior usage in the automobile.

Another obstacle that may tie down the organosol market potential is difficulty in obtaining a sufficiently high initial gloss in the auto finish (although gloss retention is said to be very good). Just last month, however, W. H. McNight, fellow, Bakelite fellowship, Mellon Institute, Pittsburgh, Pa., cited the development of a high-gloss organosol finish that doesn't need buffing.

Exterior coating quality isn't the only problem troubling vinyl marketers. Some manufacturers point up the effort of retraining personnel in the use of the organosol application technique. Those with more optimism, however, think that the switch to the organosol technique may be less difficult than supposed. The latter view may be spurred by hot-spray application of organosols using newly developed underwriter-approved electric heaters (*CW, Nov. 20, p. 102*).

This development, some conjecture, may make it possible one day to

* Production of leading resins used in protective coatings in 1953: phthalic anhydride alkyd types, 389.2 million lbs.; rosin esters, 103.4 million lbs.; styrene (including styrene-alkyd polyester resins), 84.3 million lbs.; urea and melamines, 30.4 million lbs.; phenolic (and other tar-acid resins), 28.2 million lbs.

† These PVC applications are known as textured organosol finishes, were developed about three years ago by John L. Armitage Co., (Newark, N. J.).

* Introduced by Union Carbide and Carbon Corp. in 1943.

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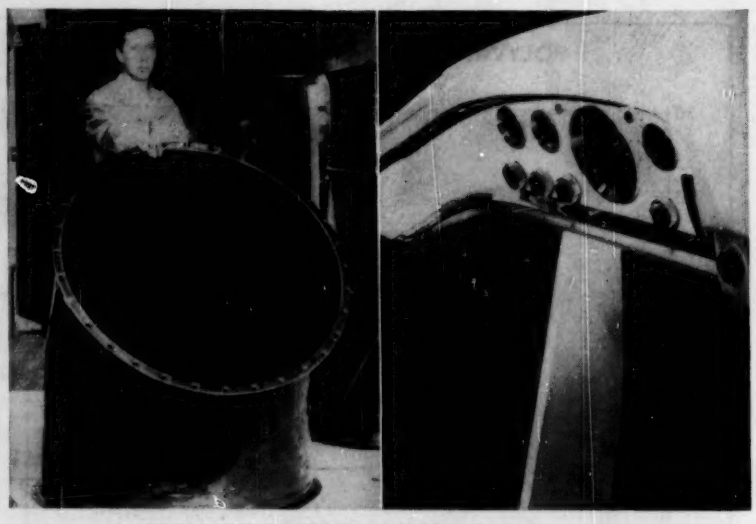

FROM FUME DUCTS to dashboards, PVC targets.

hot-spray and fuse the coating in the same operation. The organosols could then strike a solid competitive blow at the marketers of nitrocellulose lacquer.

Ketone Cost Cut: Meanwhile, several segments of the chemical industry will watch for the impact of organosol and plastisol vinyl resins on sales of solvents and plasticizers. The currently used solution vinyl resin coatings consist of 20% solids and 80% thinner-solvent mixture. No less than half of this mixture must be ketones, especially MIBK and MEK. The remainder is usually xylene or similar aromatic hydrocarbons.

In contrast, the typical organosol vinyl dispersion contains 40-50% solids, together with a thinner-solvent mixture holding only about 15% ketones (usually di-isobutyl ketone) and 85% xylenes or naphthenic thinners. The upshot is that the use of aromatic hydrocarbons instead of the costlier ketones cuts application costs for the organosols.

Plastisol Push: While plans for organosol dispersions are talked up, there is a steady drive for plastisol markets—in applications where heavy coatings are needed. In a typical plastisol protective coating, some 60 to 100 parts of plasticizer are mixed with 100 parts of polyvinyl chloride and copolymer resin.

PVC plastisols are already being used to coat plating racks, and pipes holding corrosive liquids. They, like the organosols, are tough, strong, abrasion-resistant. (The greater film thickness of the plastisols improve these properties of PVC coatings: resistance to inorganic acids, alkalis, oxidizing agents, greases, oils, and alcohols.) Plastisol coatings, too, will have many specialty applications, are already in use on dish racks. A lively demand for them may come from coaters of fume ducts (*see cut*).

While the public is getting used to these two new terms—organosols and plastisols—there will be a sustained growth of the well-established PVC protective coating market by the familiar solution technique. Major current outlets are in intermediate and top coats of naval ship bottoms; for corrosion-resistant coats on oilfield equipment, offshore rigs; on locks and dams; and for strippable coatings, as used in fleet "moth-balling."

But once the manufacturers' "show me" challenge has been met by successful field runs of organosol and plastisol coatings, proponents expect to race ahead to new sales.

Titanium Shape-up

Titanium continues to be an intriguing topic of conversation among government agencies, and a raft of present (and potential) producers, as well as consumers. Latest reports out of Washington concern the current dickering between General Services Administration and Du Pont over another titanium contract.

If the deal goes through, it will call for construction of a 7500-ton/year plant near Waverly, Tenn., which would lift scheduled U.S. titanium capacity up to 30,000 tons by 1958, make Du Pont the country's biggest producer. (The company now has a 3600-ton plant at Newport, Del., operating under one of GSA's first ti-

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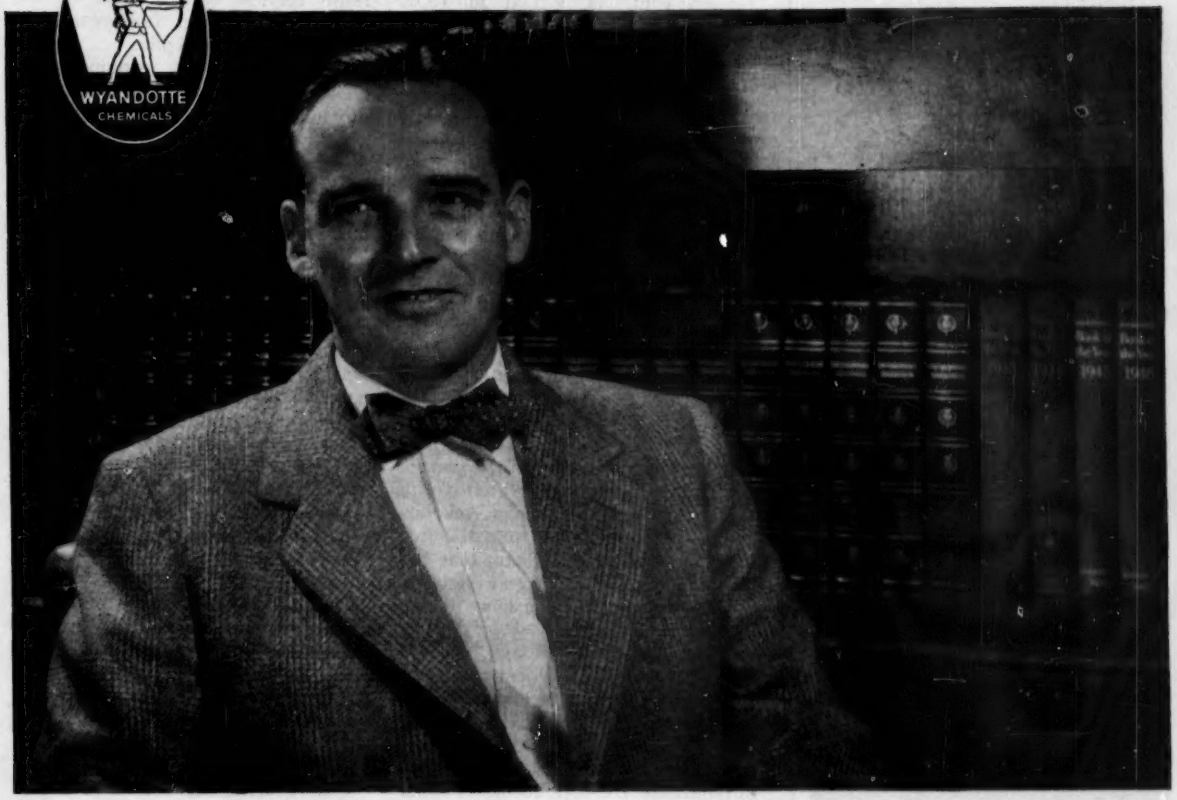

Edwin M. Ross, manager of production division, W. H. & L. D. Betz, Philadelphia, nationally known chemical engineers and consultants.

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tanium contracts, signed in 1952. Under its terms, GSA advanced $14.7 million for plant costs and guaranteed a market for bulk of the installation's output.)

The second contract, however, does not involve a government loan. Setup for the new plant will probably have Du Pont build, with its own capital (about $32 million), and GSA agree to buy most of the turnout for five years, or pay unamortized plant costs in case of cancellation. That could happen if the modified Kroll magnesium reduction process to be used becomes obsolete.

Despite the fact negotiations have been going on for months (*CW Market Letter, April 17*), insiders hear that signing of the contract may still be many months off. Reason: a few more wrinkles to be ironed out. For instance, Du Pont may seek formal antitrust clearance from the Justice Dept. There's also talk that the company and GSA aren't sighting down the same barrel on some financing terms.

Early this year, though, it was agreed that the firm would spend up to $600,000 for design and engineering work prior to any agreement on a purchase commitment. If the deal doesn't work out, GSA is obligated to reimburse Du Pont for these costs.

Titanium To Date: So far the government's titanium expansion program shapes up like this: In addition to the first Du Pont contract, GSA has market guarantee arrangements with Titanium Metals (3600-ton plant); Crane (6000 tons); Dow (1800 tons); and Union Carbide (7500 tons). The last two are privately financed: Titanium Metals received a $15-million loan, Crane, $24.9 million, to build their facilities.

Much has been said, in recent months, about a second round of titanium expansion that would boost capacity well above the current 30,000-ton target, but so far no official announcement has been made. The Office of Defense Mobilization has received an approximate estimate of military requirements for a five-year war, which would form the basis of any new expansion goal.

ODM must now determine how to meet these needs. Two possible routes: underwriting new facilities; stockpiling from existing plants. More likely method, though, would involve a combination of both. Government planners figure there's not enough commercial demand to justify throwing up a great number of new titanium plants, nor would there be sufficient metal available for current defense requirements if bulk of the output in the next few years was diverted to the stockpile.

But this much is certain: when ODM decides what to do, and military take is more accurately defined, a new expansion goal will be set up. Meanwhile, the agency has directed GSA to maintain titanium talks with anyone interested in getting into the business.

Besides the five contracts in effect and the one pending with Du Pont, GSA has negotiated with Titanium Metals for another plant (about 4000 tons), and Harvey Machine (6000 tons). Provisions would be similar to Du Pont's Waverly contract.

Also under discussion is a loan to Monsanto for construction of a pilot plant to test a new titanium process. The agency has already made such a loan to Horizons Titanium, and has leased an idle magnesium plant to Western Pyromet for pilot work.

Other firms that would probably figure in a second titanium expansion round include Kennecott Copper, Kaiser Aluminum, New Jersey Zinc, National Distillers, Glidden, Anaconda Copper, Eagle-Picher. Each has its foot in GSA's door now. Another, Olin Industries, has reportedly lost interest since merging with Mathieson.

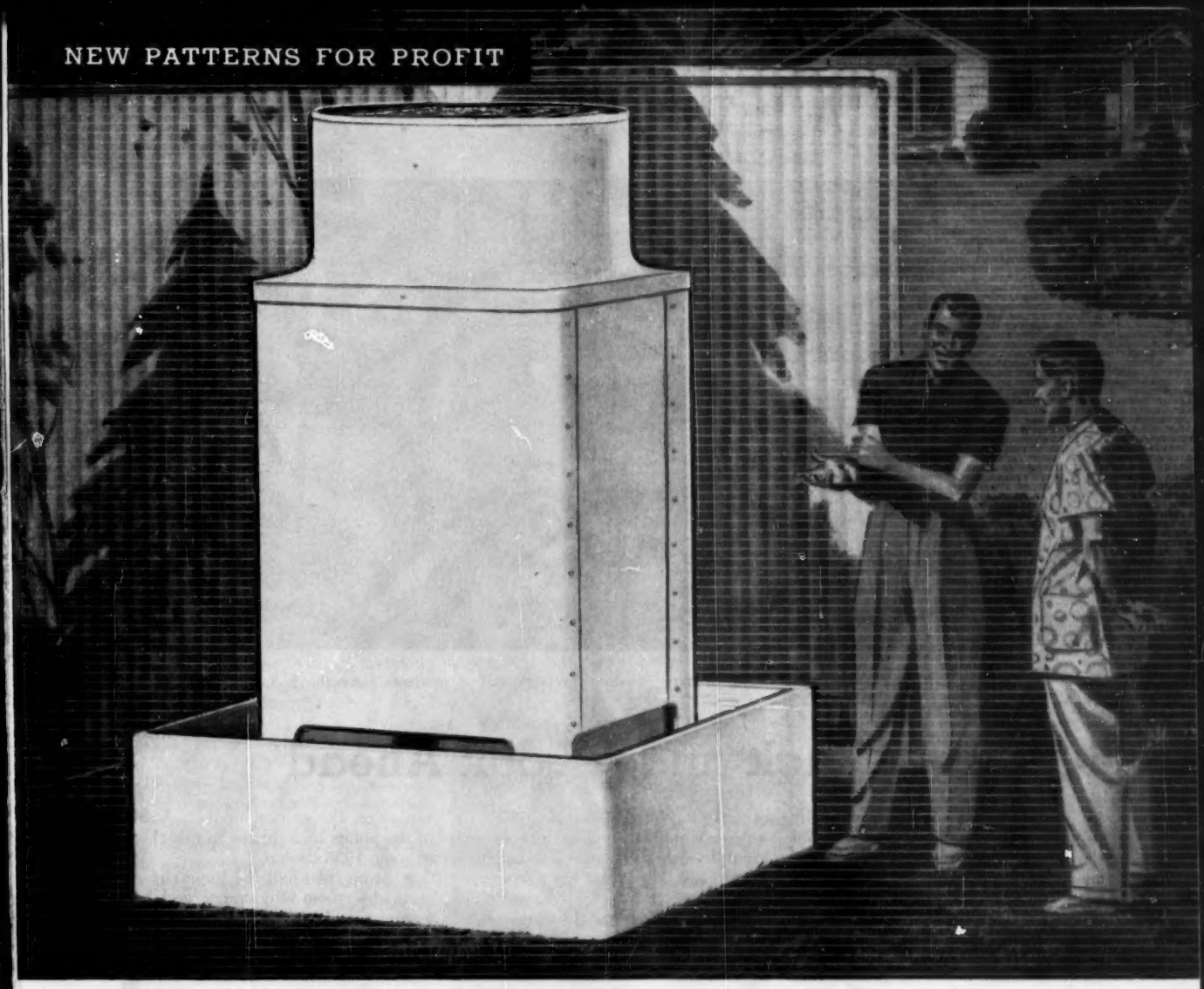
One government official says privately—but not critically—that most of these companies are slow on the titanium uptake. He feels that they are wisely unwilling to invest in a big way until there's some real sign that a commercial market exists. Right now, outlets are strictly "ephemeral," he says, in defense production and possible stockpiling—not enough of a lure for firms looking for more than a simple return on an investment.

Actually, no hefty nondefense markets have developed. This year's titanium sponge production will hit some 5000 tons (about double last year's), but consumption will remain near '53's level—approximately 1200 tons.

Most of the U.S. output continues to funnel into a government "working inventory." This was set up some months ago when even defense manufacturers weren't able to blot up titanium producitton. The so-called inventory is supposed to serve as a stimulus for metal-working firms that still shy away from titanium use because of fears of an unstable supply source.

Cuts in titanium sponge prices, like the recent one (*CW Market Letter, Dec. 11*), may prove even more persuasive in overcoming resistance of potential industrial outlets.

NEW PATTERNS FOR PROFIT



Could Easily Assembled Reinforced Plastic Cooling Towers Cut "Water Cost," Spur Built-in Home Air Conditioning?

Excessive water use—that's been a major drawback to built-in air conditioning for private homes... when a small "custom built" cooling tower was beyond the "budget." But a standardized, molded plastic cooling tower might be the answer!

The "home size" cooling tower illustrated provides 48 cubic feet for standard redwood filling . . . consists of six pieces, easily assembled from just ***four*** separate moldings; could be shipped "knocked down." The attractive, colorful reinforced plastic is the same material used in glass-reinforced plastic sports car bodies, flat and corrugated building panels, molded bath tubs, and hundreds of other applications. It is a "no maintenance" material, light in weight, rot-proof, chemically resistant.

The cooling tower shown is a preliminary design . . . but worked out in all details except the filling. If you would be interested in manufacturing (or distributing) this tower, contact Monsanto. If you'd like to study a set of engineering drawings showing the design of the molded cover, sides, sump and details of assembly, send $1.00 to cover handling and mailing. Manufacturers who prefer to subcontract for reinforced plastic parts can reach reliable custom molders through Monsanto.

Monsanto is a major producer of **STYRENE MONOMER, PHTHALIC** and **MALEIC ANHYDRIDE,** and **FUMARIC ACID** . . . basic raw materials used in the manufacture of polyester resins. For application details, write or call **MONSANTO CHEMICAL COMPANY, ROOM 1503, PLASTICS DIVISION, SPRINGFIELD, MASS.**

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AEROSOL DISPLAY: A colorful showing of over 250 new pressure-packed products from the U.S. and abroad.

A Glance Back and a Look Ahead

To keep up with their industries by keeping abreast of the latest ideas and developments in their fields, some 800 specialties makers poured into Manhattan's Hotel New Yorker last week. It was the 41st annual meeting of the Chemical Specialties Manufacturers' Assn.

Its program this year centered more on solidly technical papers than on new products, and they were aired in an atmosphere of general satisfaction with '54's sales. In '55, CSMA's Mel Fuld sees "competitive prosperity."

It was a program, too, that featured the introduction of still another product survey—this time of hydraulic fluids. The Automotive Division, youngest of CSMA's sections, initiated the census as part of its heavy emphasis on various aspects of making and selling the fluids.

Internal Policing: The concentration of attention on hydraulic fluids showed that CSMA feels increasing concern about the problem of substandard brake fluids. The survey revealed that of about 6 million gal. of fluid made in '53, over 2 million gal. were of fluids that could not meet minimum specifications of the Society of Automotive Engineers (fluids that, in the opinion of many authorities, are a serious potential motoring hazard).

The CSMA is aware that if it doesn't do what it can to improve the quality of brake fluids itself, outside influences—state or municipal governments, for example—may legislate to force them to. Already, Minnesota has a strict law dealing with brake fluids, and so has New Jersey. Further, the Automotive Division was told, a substantial number of other states are planning similar legislation.

The Aerosol Division program, too, included a survey—Du Pont's biannual report on the aerosol market. A few of the points brought out in this check of some 1983 dealers:

- More than half the buyers of insecticides, room deodorants, and hair lacquers will choose the pressurized product if offered a choice in packages.
- In '54, 97-99% of drug, variety, and hardware stores sold the push-button products (and 88% of depart-

SULLIVAN, GOODHUE: For work on aerosol insecticides, third CSMA award.

ment stores, 93% groceries, 52% service stations).

• Though insecticides are still the most commonly stocked item, personal toiletries (shaving cream, hair lacquers) are now heavily stocked in most stores.

The aerosolers also had their annual contest on good design in pressure packaging—grand award winner this year was Dache Invisible Net, a hair spray made by General Beauty Products (New York) (*CW Newsletter, Dec. 11*).

Creation of standards of performance, to help purchasing agents select proper cleaning compounds, disinfectants, and floor waxes was suggested by Dewey Palmer, of the Hospital Bureau of Standards (New York), to the Soaps, Detergents, and Sanitary Chemical Products Division. Speakers from other fields, such as hotel, restaurants, bakeries and airlines outlined their needs—both in product type and in means to simplify the job of purchasing agents.

Major feature of the Disinfectant and Sanitizers Division was a roundup of the new developments and uses of various germ-killing products—covered were phenolic compounds, chlorine and chlorine-compounds, quaternary ammonium compounds, and iodine. The forum was inspired by a recent book on the subject: "Disinfectants, Germicides, Fungicides and Sterilization."

Election of officers meant second terms for '54's officers—Melvin Fuld (Fuld Bros., Inc., Baltimore) was re-elected president, and also re-elected were Dr. E. G. Klarmann (Lehn & Fink Products Corp., New York), first vice-president; Harry E. Peterson, (Continental Filling Corp., Danville, Ill.), second vice-president; P. C. Reilly, Jr. (Reilly Tar & Chemical Corp., Indianapolis), treasurer; and H. W. Hamilton, secretary.

Newly elected to the board of directors: Dr. Edmond G. Young (Kinetic Chemicals Division, Du Pont, Wilmington, Del.); Dr. Alfred Weed (John Powell & Co., New York); and W. S. Jessop (U.S. Sanitary Specialties Co., Chicago).

No Refills

Antibiotics slipped into a new role last week—as bacteria killer in a new dental filling cement made by Oskar Schaefer Co. (Jersey City, N.J.) The Food & Drug Administration has just okayed the cement for ordinary dental use.

Developed by Dr. Maxwell Colton after several years of research, the cement makes use of a 0.4% mixture of a combination of streptomycin, Aureomycin, chloramphenicol, and bacitracin. The "polybiotic" has been shown to sterilize the filled cavity, prevent decay under the filling.

The antibiotics are added by Schaefer as the cement formulation is being "tumbled," are thoroughly mixed in. Shelf life of the compound is good, and although the treated cement is perhaps twice the price of plain cement, the increased cost per filling is negligible.

Effective sterilants for dental filling have been sought for some time; admittedly most procedures currently used—with phenol or silver nitrate—tend to discolor teeth. Apparently, the prime reason decay under fillings isn't more prevalent is that moisture necessary for bacteria growth is sealed

COLTON: For long-lasting dental fillings, antibiotic-fortified cements.

off. But seepage can reactivate them, causing more decay and demanding redrilling, refilling.

Polybiotics can't be used in every sort of filling material—they aren't well adapted to amalgams, for example. For use with the antibiotics, Schaefer has developed a new formula claimed to be stronger, more durable than conventional filling.

Colton has found the cement especially valuable in children's dentistry, where complete removal of the decayed tooth material is difficult because of danger in exposing the nerve, but its use isn't restricted, of course. And to children or adults, the polybiotic cement can mean fewer drill sessions.

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BRITISH SMILES: Five-day price war pleases housewives, inspires cartoonists.

Transatlantic Tempest

Detergent competition in Britain is becoming downright American. Only a few weeks have passed since British housewives witnessed an unprecedented price-cutting spree that's still resounding. Merchandisers' goal: to acquire a heftier slice of a retail market that's equivalent to $250 million.

Despite who wins or loses business, one thing is clear—more and more synthetic detergents will be consumed by British housewives. Back in 1952, syndets accounted for less than a quarter of the total detergent sales, but last year they were over one third (170,000 tons out of 500,000 tons).

Giant Versus Giant: The big two in the competitive war:

- Unilever, Ltd. Its syndets: Omo, Surf, Wisk; soap powders: Persil, Sunlight, Rinso.
- Thomas Hedley & Co., Ltd. It's Procter & Gamble's wholly owned British subsidiary. Syndets: Daz, Dreft, Tide; powders: Fairy Soap, Oxydol, Sylvan Flakes.

Also in the running are Colgate Palmolive Ltd., with the syndet Fab, and the British Wholesale Co-Operative Society, with still another, Spel. In addition, there are a number of small independents that have somewhere around 10% of the total market. (In the trade it's estimated that Hedley has three-quarters of the retail sales of syndets, that Unilever has the major share of the bar soap sales.)

Five-Day Fury: The recent price-cutting tidal wave began on Saturday, Nov. 20. That day, Unilever announced it was slashing the prices of both its synthetic detergents and its soap powders. Colgate followed suit and so did Co-op.

On Tuesday Hedley cut the prices of its powdered products and, at the same time, undercut Unilever on bar soaps. On Wednesday Unilever matched Hedley's bar soap cuts.*

While such a chain reaction is still novel in British retail trading, soap companies are more than accustomed to competing in other vigorous ways. Here are some of the more successful techniques:

* Before and after: Unilever—Persil, 23¢, cut to 21¢; Sunlight, 14¢-12¢; Rinso, 23¢-21¢; Omo, 27¢-23¢; Surf, 27¢-23¢; Wisk, 21¢-20¢; Hedley—Fairy Soap, 14¢-13¢; Oxydol, 26¢-20¢; Sylvan Flakes, 22¢-19¢; Daz, 27¢-26¢; Tide, 27¢-26¢; Dreft, no change. Most prices are for large sizes.

- The give-away. Besides the box top coupons technique that lets the housewive get the next package at a discount, soap concerns have also doled out: two packages for price of one, shampoos, spoons, bread knives, and, through nationwide contests, $14,000 furnished homes, and automobiles.
- Are you eleemosynary-minded? Earlier this year, Hedley offered to subscribe one penny to a designated charity for every Hedley box top sent in. Extra prize: $2800 for the charity nominated by each of the three collecting groups—the Boy Scouts, the Girl Guides (Girl Scouts), and the Women's Institute. Outcome: millions of box tops were gathered, some 16,500 checks were sent out, the largest over $7500.
- On the line. Until last month's whirlwind, one company gave cash for its box tops. Method: a housewife would buy a large package selling for 27¢ and on mailing in the top would be rewarded with a shilling postal order (14¢).
- We deliver. When Unilever introduced Omo in June of this year, it delivered several million packages direct to households without a charge of any kind.

The cost of each of these schemes is heavy. In the case of Omo, the retail value of the packages alone was around $3 million. In the last 12 months, Hedley has spent over $1 million just on coupon schemes. What's more, there's the cost of advertising. In the first half of this year, Unilever and

'Yes, SPLASHO! No other detergent washes whiter . . . no other company sends a representative along to DO the washing either!'

THE EVENING NEWS—LONDON

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P-4852 Chemical Week
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P-4890 Chemical Week
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SPECIALTIES . . . .

Hedley spent $3½ million to publicize eight of their detergent powders.

Gripes and Smiles: Hit hardest by such intensified merchandising are the small independents. Generally, they're obliged to match price for price, concession for concession, bonus for bonus.

But no complaints are being registered by Britain's 15 million housewives. Too, British newspapers are more amused than alarmed by such rabid competition (*see cut*). Rough and costly though it may be, this competition will undoubtedly extend into the coming year.

•

Resin Quintet: American Cyanamid has begun marketing three new paint resins plus a pair of molding resins:

- Cycopol 340-18, a copolymer resin in low-odor solvent for interior architectural white enamels. It has greater compatibility with oils, varnishes and alkyd resins than the styrene-alkyd resins now available.
- Cycopol 341-17, a fast-drying copolymer resin in VM&P naphtha. It's suggested for floor sealers, paper and polystyrene coatings, and traffic paints.
- Rezyl Resin 750-17, a tall oil-modified alkyd resin solution in VM&P naphtha. It's recommended for production of low-cost, fast air-drying and baking finishes.
- PDL 1-969, a melamine-urea-formaldehyde resin, and PDL 1-1970, a urea-formaldehyde resin. Both are binder resins developed for fabrication of sawdust and wood chips into wood-waste hardboards. They're said to impart no color, to cure at lower temperatures and in less time than other binders.

•

Textured for Tinting: A modified vegetable oil designed as a vehicle for tinting colors usable in water-, alkyd- and oil-base paints is now sold by Spencer Kellogg and Sons, Inc. (Buffalo). Name: Kelsol.

•

Superstable: A new silicone parting agent for rubber, plastics, and metal has been made available by Dow Corning Corp. (Midland, Mich.). Dubbed Mold Release Emulsion 36, it's said to be more resistant to creaming or separation than any comparable silicone emulsion previously developed. Samples may be had on request.

•

Self-Polisher: A new self-polishing floor wax that combines a clear plastic in an emulsion with yellow carnauba wax is being marketed by West Disinfecting Co. (Long Island City, N.Y.). A single-application type, Super Westwax is suggested for use wher-

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•

Rose Protector: Du Pont Rose Insecticide and Fungicide will soon succeed Du Pont Rose Dust for control of black spot and other rose diseases. The product is a combination of the Massey formula of sulfur and ferbam fungicide, plus three insecticides—methoxychlor, lindane and Aramite.

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Metal Putty: Wood Hill Co. (Cleveland) has a new metal putty that works like plastic wood. It dries quickly, can be filed, sawed or drilled the same as metal. It will stick to wood, glass, pottery, leather. A 12-oz. can costs $1.35.

WIDE WORLD

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ORDINARY liquid starch has a new application—in the arts. The person most convinced of this is Stanley Drabinowicz, art supervisor in Evanston, Ill., schools. In the above photo he finger-paints with water colors made by mixing the starch with dry pigment. The schoolmaster says the starch gives colors greater brilliance and makes them easier to handle. The colors dry with a matte finish.

B & A PURIFIED AMMONIUM OXALATE Granular

PHYSICAL AND CHEMICAL PROPERTIES

Appearance	fine white needle crystals
Formula	$(NH_4)_2C_2O_4.H_2O$
Molecular Weight	142.12
Specific Gravity, 20° C.	1.5
Solubility in water	2.5 grams / 100 grams H_2O at 0° C. 11.8 grams / 100 grams H_2O at 50° C.

Slightly soluble in alcohol
Insoluble in ammonia

Typical Analysis:

Assay ($(NH_4)_2C_2O_4.H_2O$)	99.5 %
Insoluble in water	0.015 %
Nonvolatile	0.03 %
Chloride (Cl)	0.003 %
Sulfate (SO_4)	0.02 %
Heavy Metals (as Pb)	0.002 %
Iron (Fe)	0.001 %

Screen Size: Thru 40 mesh ..... 90 %

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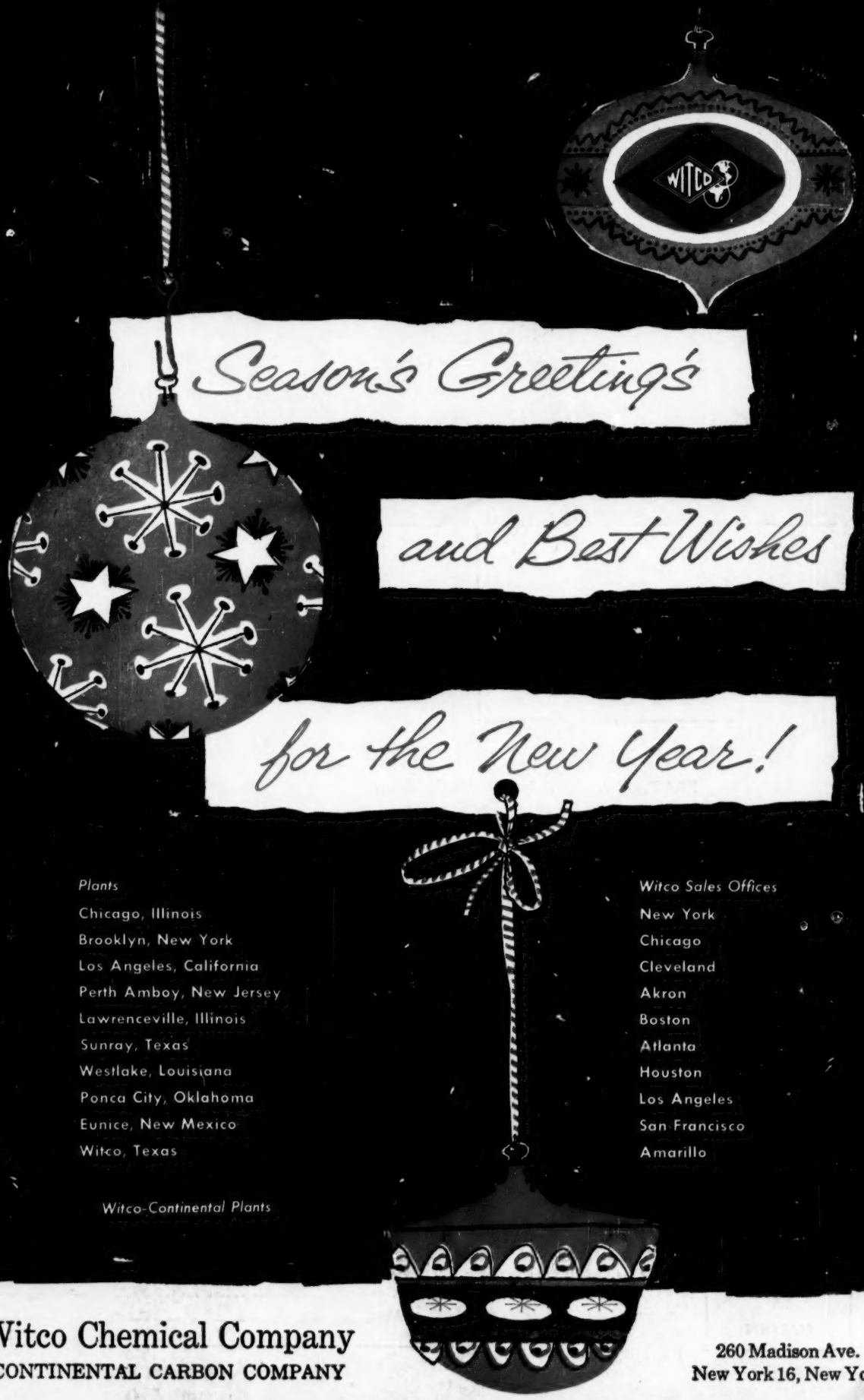
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